

Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 213	Core	Digital Systems - Basics & Applications Logic	2	3	5	6
2	AVTE 214	Core	Electronic Circuits & Electrical Machine	2	3	5	6
3	AVTE 215	Core	Aircrafts Structure & Aerospace Technology	2	2	4	6
4	AVTE 221	Core	Electromagnetic Field Theory	2	2	4	6
5	AVTE 232	Core	Thermodynamics of Propulsion Applied Aerodynamics-Basics	2	0	2	4
6	CREQ 245	Core	Training	-	-	-	-
7	AVTE 222	Secondary	Probability, Signals & Systems	2	2	4	6
8	MATH 252	Secondary	Mathematics II	3	0	3	6
9	CREQ 244	Secondary	Programming II	1	2	3	4
Total				16	14	30	44
The perce. of core hours = 67%				The perce. of theoretical hours = 53%			
The perce. of secondary hours = 33%				The perce. of practical hours = 47%			

Subject Number: AVTE 213 Subject : Digital Systems - Basics & Applications Logic L T P C 2 0 3 6	
Objective of the course: To provide an introduction to the fundamentals of logic, truth table, & understanding the logic circuits and systems. In additive, analysis and design the simple logic circuits.	
Theoretical syllabus	
Week	Contents
1-2	Number systems binary - decimal - octal and hexadecimal number systems - conversion between number systems - binary codes - arithmetic operation of binary system.
3-5	Logic gates, Boolean Algebra & Simplification of logic circuits logic gates - logic circuit - logic equation and truth table (product of sum and sum of product) - simplification of logic circuit (Boolean algebra and Karnugh maps) - two, three, four variable K-map - don't care conditions - Demorgan's laws - NAND, NAND network - Binary codes
6-7	Arithmetic Logic Circuits Half & Full adder - Half & Full subtractor - Serial and parallel binary adders - (1'S and 2'S) complements circuit - BCD adder - comparator circuits.
8-9	Multivibrators RS flip flop - clocked RS flip flop - D flip flop - T flip flop - JK flip flop - master/slave flip flop.
10 - 12	Counters Asynchronous counter - design of asynchronous counters - synchronous counters - design of synchronous counters. Examples: 4bits counter - (Up-down) counter - Ripple counter - (Mod-10) counter - Counter applications.
13-14	Registers Serial shift register - Parallel shift register - Ring counter - Static and dynamic registers - Johnson counter
15-16	Multiplexer, Demultiplexer, Decoder, Encoder
17-18	Test of logic circuit - Fault model - Path Sensitizing - Random test - Test of sequential circuit.
19-22	Synchronous sequential circuit Basic design steps - Mealy state model - Serial adder example - Design of counter using sequential circuit.
23-26	Asynchronous sequential circuit Analysis of asynchronous circuit - Synthesis of asynchronous circuit - State reduction - State assignment - Hazard
27-28	555 Timer 555 Architecture - Astable circuit design - Mono stable circuit design.
29-30	Convertors D/A and A/D converter - Types of D/A - Types of A/D - D/A accuracy and resolution
Practical syllabus	
1	logic gates (AND, OR, & NOT) using diodes , transistor ,& resistors.
2	Implement logic gates (AND, OR, NOT, AND, NOR, XOR & XNOR)
3	logic gates (AND, OR, NOT, NAND, NOR, XOR, & XNOR) by using integrated circuits IC {7408, 7432, 7404, 7400, 7402, 7486 ,& 74266}
4	Boolean's algebraic

5	Demorgan's theorem
6	Implement logic gates (AND,OR, NOT, NAND, NOR, XOR &XNOR) using NAND & NOR gates only
7	1bit comparator - 2bits comparator - 3bits comparator
8	Half adder - Half subtract - Full adder - Full subtract
9	2-bits multiplication circuit
10	Coding circuit from BCD to Cray code
11	SR flip flop - JK flip flop -D flip flop -T flip flop -
12	Serial counter (Asynchronies counter) A-Up counter , B-Down counter
13	Parallel counter (Synchronies counter)
14	Johnson & ring counter
15	Decade counter
16	Shift register A- Shift right register (SRR) , B- Shift left register (SLR)
17	Sequence detector
18	Compound counter
19	Multiplexer: A-4x1 multiplexer using logic gates, B-8x1 multiplexer using IC 74151
20	Decoder 2x4 using logic gates
21	Serial adder example - Design of counter using sequential circuit
22	Synthesis of asynchronous circuit
23	State reduction - State assignment
24	Hazard
25	555timer (Astable circuit design - Mono stable circuit design)
26	Parity checker
27	Digital to analog converter (D/C)
28	Analog to digital convertor (A/D)

Recommended Books:

- Digital principles and applications, by Albert Paul Malvino, 2nd Edition.
- Digital Logic Circuits by D.A.Godse A.P.Godse, Technical Publications 2008.

<p>Subject Number: AVTE 214 Subject : Electronic Circuits & Electrical Machine L T P C 2 0 3 6 Objective of the course: To learn the student analysis and design of operational amplifier, power amplifier, and oscillators. In additive, studying electrical machine in two parts motors and genertors.</p>	
Theoretical syllabus	
Week	Contents
1-3	Operational Amplifiers The basic operational amplifier - The D coupled differential amplifier - Transfer characteristics of a differential offset error voltage and currents - Measurement of operational amplifier parameters - Frequency response of operational amplifiers.
4-6	Linear analog system Basic operational amplifier applications - Differential DC amplifiers analog integrator and differential active filters integrated circuit tuned amplifier - A cascade audio amplifier comparators sample and hold circuits precision AC/DC convertors logarithmic amplifiers - Waveform generators generative comparator (Schmitt trigger).
7-10	Power amplifiers Class A large-signal amplifiers second harmonic distortion - Higher order harmonic generation - The transformer coupled audio power amplifier efficiency - Push pull amplifier class B amplifier - Class AB - Regulated power supply series voltage regulator.
11-13	Feedback amplifiers The feedback concept - The transfer gain with feedback characteristics of negative feedback amplifiers - Input resistance - Output resistance - Method of analysis of a feedback amplifier - Voltage-series feedback - A voltage series feedback pair - Current series feedback - Current shunt feedback - Voltage shunt feedback.
14-15	Oscillators:- Type of oscillators - Oscillators pairs -The Hartley oscillators - The Colpitt oscillators - The ultra audio oscillators - Crystal oscillators - Crystal and temperature coefficients - crystal heater chambers - Crystal holders - Other crystal circuits - Some high frequency oscillators - Audio oscillators - Dynatron oscillators - RC oscillators - Parasitic oscillators - Indication of oscillators - Oscillators stability.
16-17	Introduction Introduction to electrical machines - Classification of electrical machines - Construction of rotating machines.
18	DC machine construction: EMF equation - Torque and speed equations of DC machine. DC generators (classification of DC generators and characteristic curves for each type).
19-20	Losses and Efficiency of DC generators: DC Motors (classification of DC motors and characteristic curves for each type) - Speed control of DC motors - Starting of DC motors - Testing of DC machines - Uses of DC motors.
20-21	Transformers: (Basic principle, construction of single phase transformer, and EMF equation) - Transformer Equivalent Circuit - Tests on transformers - Losses and Efficiency - Current and voltage transformers - Auto transformer - 3-phase power transformers.
22-23	Three phase induction motors:

	(construction, theory of rotating magnetic field, speed and slip) - Equivalent circuit of 3-phase IM, Torque – slip, and torque speed characteristics. Tests on IM - Losses - Power stages and Efficiency - Starting and speed control of 3-phase IM, .
24-25	Single phase motors: (classification , methods of rotating field production) - Equivalent circuit of single phase IM. Tests on single phase IM - Losses and Efficiency.
26-27	Synchronous Machines: (general theory and construction) - Alternator equivalent circuit - voltage equation - Phasor diagram - and voltage regulation. Load characteristic of alternator - Input and output power equations.
28-29	Synchronous Motors; (principle of operation and phasor diagram) - Load characteristic of synchronous motor - Input and output power equations - Max. output power. Torque equation - Methods of starting - Applications of synchronous Motors.
30	Special Purpose Motors: Linear motors - Stepper motors. DC Servomotors and AC Servomotors. Conversion from AC to DC.

Practical Syllabus

1	Inverter amplifier circuit by operational amplifier
2	Non-inverter amplifier circuit by operational amplifier
3	Summation amplifier circuit by operational amplifier
4	Subtract or amplifier circuit by operational amplifier
5	Integrator amplifier circuit by operational amplifier
6	Differential amplifier circuit by operational amplifier
7	Half wave rectifier circuit by operational amplifier
8	Full wave rectifier circuit by operational amplifier
9	Compactor circuit by operational amplifier
10	Smith trigger circuit
11	Logarithmic amplifier circuit
12	Low pass filter circuit by operational amplifier
13	High pass filter circuit by operational amplifier
14	Square wave generator circuit by operational amplifier
15	Triangle wave generator circuit by operational amplifier
16	Introduction to Industrial safety and security principles
17	Magnetizing curve for separately excited and self excited generators.
18	EMF vs. speed curve for separately excited DC generator and find out the critical resistance.
19	EMF vs. speed curve for shunt DC generator and find out the critical resistance.
20	Load, internal and external characteristic curves for separately excited DC generator.
21	Load, internal and external characteristic curves for shunt DC generator.
22	Load, internal and external characteristic curves for series DC generator.
23	Load, internal and external characteristic curves for compound (cumulative and differential) DC generator.
24	Parallel operation of two separately excited DC generators.
25	Load characteristic, torque curve, and efficiency for DC series motor.
26	Load characteristic, torque curve, and efficiency for DC shunt motor.
27	Speed control for DC shunt motor (Supply voltage and Field current control)
28	Losses and Efficiency calculation for DC machine.
29	Open circuit and Short circuit Tests on single phase transformer.
30	Load Test on single phase transformer.

Recommended Books:

Text Books:

- Engineering Circuit Analysis by William Hayt & Kemmerly.
- Electric Machinery Fundamentals (3rd Edition) by Stephen J. Chapman.

Reference

- Engineering Circuit Analysis by James W. Nilsson.
- Introduction to Electric Circuits by Richard C. Dorf.
- Electric Machines: Theory, Operation, Applications, Adjustment and Control by Charles Hubert.
- Direct & Alternating Current Machinery by Rosenblatt and Friedman.

Subject Number: AVTE 215 Subject : Aircrafts Structure & Aerospace Technology L T P C 2 0 2 6	
Objective of course: To provide understanding, analysis and design simple aircraft structural components and its system to the engineering students.	
Theoretical syllabus	
Week	Contents
1-2	Flight controls which dealing with aerodynamics and aircraft control surfaces.
3-5	Aircraft construction Basic structure of aircraft - Landing gears - Hydraulic - Pneumatic and fuel systems
6-7	Principle of jet reaction Thrust and power - factors effecting thrust - Compressors and jet propulsion devices
8-9	Aircraft instruments Flight - Engine auxiliary instruments.
10	Electrical system Power supply - Power generation - Electrical components.
11-12	Armament systems study Aircraft ejection system - Fundamentals of bombs and firearms - Principle and construction of ammunition and explosives .
13-15	Statically determinate structures Analysis of plane truss – Method of joints – 3 D Truss - Plane frames
16-19	Statically indeterminate structures Composite beam - Clapeyron's Three Moment Equation - Moment Distribution Method.
20-23	Energy methods Strain Energy due to axial, bending and Torsional loads – Castiglano's theorem - Maxwell's Reciprocal theorem, Unit load method - application to beams, trusses, frames, rings, etc.
24-27	Columns Columns with various end conditions – Euler's Column curve – Rankine's formula - Column with initial curvature - Eccentric loading – South well plot – Beam column.
28-30	Failure theory Maximum Stress theory – Maximum Strain Theory – Maximum Shear Stress Theory – Distortion Theory – Maximum Strain energy theory – Application to aircraft Structural problems
Practical syllabus	
1	Determination of Young's modulus of steel using mechanical extensometers.
2	Determination of Young's modulus of aluminium using electrical extensometers
3	Determination of fracture strength and fracture pattern of ductile materials
4	Determination of fracture strength and fracture pattern of brittle materials
5	Stress Strain curve for various engineering materials.

6	Deflection of beams with various end conditions.
7	Verification of Maxwell's Reciprocal theorem & principle of superposition
8	Column – Testing
9	South – well's plot.
10	Riveted Joints.

Recommended Books:

Text Books:

- Analysis of Aircraft Structures – An Introduction , by Donaldson, B.K. McGraw-Hill, 1993.

Reference

- Strength of Materials, by Timoshenko, S. Vol. I and II, Princeton D. Von Nostrand Co, 1990

Subject Number: AVTE221

Subject : Electromagnetic Field Theory

L T P C

2 0 2 6

Specific Objectives of course:

To introduce fundamentals of electromagnetic field theory for understanding and analyzing electromagnetic phenomenon.

Subject Number: AVTE232 Subject : Thermodynamics of Propulsion & Applied Aerodynamics-Basics L T P C 2 0 0 4	
	Cylindrical Coordinate - Spherical Coordinate - Transformation Between Coordinates - Del Operator - Laplacian Operator - Gradient - Divergence and Curl - Null Identities.
5-6	Coulomb law Electric field intensity - Field due to continuous volume charge - Field of line charge - Field of sheet charge.
7-10	Electrostatics Electric Flux Density - Gauss Law - Application of Gauss Law - Maxwell First Equation.
11-14	Energy and Potentials in A Moving Point Charge in An Electric Field - The Line Integral - Definition of Potential Difference and Potential - The Potential Field of A Point Charge - Conservative Property - Potential Gradient - The Dipole - Energy Density in The Electric Field.
15-18	Conductors - Dielectric and Capacitance - Current and Current Density - Continuity of Current - Metallic Conductor - Boundary Conditions - Image Theory - Semiconductor - Dielectric Materials - Capacitance - Example of Capacitance.
19	Pisson and Laplace Equations.
20-23	The Steady Magnetic Field - Biot-Savar Law - Amperes Circuital Law - Magnetic Flux and Magnetic Flux Density - The Scalar and Vector Magnetic Potentials - Derivation of The Steady Magnetic Field Law.
24-26	Time varying fields and Maxwell equations - Faraday law - Displacement current - Maxwell equations in point form - Maxwell equation in integral form - The retarded potentials.
27-30	The Uniform Plane Wave - Wave Equation - Wave Propagation in Free Space - Wave Propagation in Dielectric - The Poynting Vector And Power Consideration - Propagation in Good Conductors - Skin Effect - Wave Polarization.

Recommended Books:

Text Books

- Elements of Electromagnetic by Matthew N.O. Sadiku (2nd Edition).

References

- Field and Wave Electromagnetic by David K. Cheng (2nd Edition).
- Engineering Electromagnetic by William H. Hayt (2nd Edition).
- Electronic communication System by George Kennedy (2nd Edition).
- Electromagnetic Waves and Radiating System by Balma.

Objectives of Course: To understand and develop the essential background and know how of thermodynamics. In additive introducing aerodynamics to Avionics Engineering students.	
Week	Contents
1	Zeroth law
2-6	First law and its applications to various systems - Physical properties of pure substances - Use of property tables - PVT relations - Equations of state for ideal gases.
7-10	Second law and its results - reversible and irreversible processes and cycles - Concept of entropy and its uses.
11-12	Applications of the concepts are focused on the Closed Thermodynamics System.
13-15	An introduction to the Open Systems and their applications.
16-22	Definitions and concepts related to the hydrostatics equation and Standard Atmosphere - incompressible and compressible flows and application of continuity - momentum and energy equations in their simplified forms.
23-30	Introduction to wind tunnel design and compressibility effects in aerodynamics flows

Recommended Books:

Text Books:

- Engineering Thermodynamics, An introduction Textbook by J. B. Jones/G. A. Hawkins, second edition, John Wiley & Sons Inc, 1986.
- Introduction to Flight by J. D. Anderson, Jr. (2nd/3rd).

Reference:

- Thermodynamics by Kenneth Wark.
- Applied Thermodynamics by T D Estop/Mckonkey.
- Gas Dynamics by E. A. John.
- Fundamentals of Aerodynamics by J. D. Anderson, Jr(2nd Ed.)

Subject Number: AVTE325	
Subject : Probability, Signals & Systems	
L T P C	
2 0 2 6	
Objective of Course: To develop understanding of fundamentals of probability including various probability distributions and laws of statistics and elementary statistical techniques to effectively analyze scientific data.	
Week	Contents
1-2	Introduction: Set Theory - Basic concepts of probability
3-4	Probability types: Conditional probability - Independent events -
5	Baye's formula
6-7	Discrete and continuous random variables - Distributions and density functions
8-9	Probability distributions (binomial, Poisson, Hyper geometric, Normal, Uniform and exponential)
10-15	Mean - Variance - Standard deviations - Moments and generation functions - Linear regression and curve fitting - Limits theorems - Stochastic processes - First and second order characteristics - Applications
16-23	Signals, spectrum, and filters Singularity functions - Periodic signals and Fourier series - Non periodic signals and Fourier transform - Convolution and impulses system response and filters - Correlation and spectral density - Parseval's theorem for energy signals. Laplace Transform - Z-Transform - Analysis of signals and System.
24-27	Ideal & practical filters: LPF(RC & RL) - HPF(RC &RL) - BPF - BSF.
28-30	Noise Band limited white noise - Thermal noise - Noise figure.
Practical Syllabus	
16-17	Analysis of signals
18-20	Periodicity of the signals
21-23	Demonstration of Convulsion
24	Signal sampling using different parameters
25-26	Filter design
27	Calibration of voltage controlled oscillator
28	RF radio amplifier with tuning circuit
29-30	Equalizer effects on the radio amplifier operation

Recommended Books:

Text Books:

- Introduction to Statistics by Walpole

Reference

- Modern Elementary Statistics by John E. Freund.
- Probability and its engineering uses by T.C.Fry.
- Elementary Statistics by P. A. Games & G. R. Klaro.
- Probability and Statistics by Nestollor, Rourke and Thomas.
- Introduction to Signals and Systems by Oppeheim.

- Signals and Systems- An Introduction by Leslie Balme.

Subject Number: CREQ 245 Subject : Programming II L T P C 1 0 2 4	
Objectives of Course: To introduce students different workshops types, tools used in each workshop, and manufacturing techniques of different workshops.	
Week	Contents
1	Introduction to programming using (Matlab) - Introduction to (Matlab) - Menu bar , tool bar, and program windows
2-5	Format, Numbers & Variables Real, Integer , Inf ,NaN, Complex numbers - Variable Names - Examples on variable names - Show the results - Examples on (+ , - , * , /) - Outputs - Intermediate results during calculations.
6-8	Built-in-functions - Trigonometric Functions (sin , cos , tan , sec) - Elementary Functions (abs, log10 , log, exp, sqrt) Functions - polyarea (X,Y) - polygon - Standard Deviation - abs function - (max) - (min) - (mean)
9	Logical commands - Logical Operations - > greater than - >= greater than or equal - < less than - <= less than or equal - == equal - ~= not equal - Logical commands OR (), AND (&).
10-12	Strings manipulation - Creating Strings - save Conditional commands - if end - If elseif else function - Examples - Problems
13-14	loops - for - while - Program control - Example - Problems.
15	Matrices - Matrices manipulation
16	Matrices Operations - Matlab as a calculator - Basic mathematical operations - + , - , * , / , ^
17-21	Matrix construction - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions - Matrix-Vector product - Matrix-Matrix product - Logical commands - Comparison tests - Examples - Problems.
22-23	Vectors - Row Vectors, Colon Notation (:) - Extracting Bits of a vector - Column Vectors - Transposing - Examples and Problems.
24-26	Transformation functions - Rotation, Scaling, Shearing, Reflection, Translation. Write formatted data to file - fid=fopen(filename,'w') fprintf(fid,'format',list of variables) - Examples. Read formatted data from file - fid=fopen(filename,'r') fscanf(fid,'format',size) - Examples.
27-30	Plotting by Matlab - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot - Examples and Problems.

Subject Number: MATH 252	
Subject : Mathematic II	
L T P C	
3 0 0 6	
Objectives of Course: To provide detailed knowledge of basic principles, methods, and clear percentage of ordinary differential equations and partial differential equations used in engineering fields especially in mechanics, dynamics, structure, communications and electronics.	
Week	Contents
1-5	Ordinary Linear Differential Equations - 1 st order differential equations - Separable - Homogeneous - Exact - Linear - Bernoulli - 2 nd Order Differential Equations - Reducible to 1 st order - Homogeneous - Non Homogeneous - Higher Order Differential Equations - Homogeneous - Non Homogeneous - Applications
6-9	Sequences and Series - Sequence - Series - Geometric Series - Tests of Convergence - Definition - The General Term Test - The Integral Test - The Comparison Test - The Limit Comparison Test - The Ratio Test - The Root Test - Alternating Series - Power Series - Interval of Convergence - Taylor Series - Maclaurin Series - Applications
10	Fourier Series - Periodic Function - Even and Odd Functions - Half Range Expansion Function
11-14	Partial Differentiation - Definition - Mechanism of Differentiation - Functions of Two Variables - Functions of Higher Variables - Transformation - Chain Rule - Total Differential - Gradient, Divergence, and Curl of Vector - Equation of Normal Line and Tangent Plane - Directional Derivative - Maxima, Minima and Saddle Points - Lagrange Theorem
15	General Applications
16-19	Vector - Vector in Space - Parallel Vectors - Triple Product - Volume of Box - Projection of Two Vectors - Applications - Equation of Line in Space - Equation of Plane in space - Applications - Vector Valued Functions - Curvature - Motion of Particle.
20-22	Applications of Double and Triple Integrals - Sketching of Geometric Shapes - Double Integrals - Triple Integrals - Applications - Jacobian Transformation - Area in Polar Curve - Surface Area
23	Special Functions - Gama Function - Beta Function
24-29	Polar Coordinates - Polar Curve Representation - Sketching of Polar Curve - General Curve Special Curve (Line, Circle, Conic Section) - Rotation of Axis - The Arc Length of Polar Curve - Surface Area of Rotation - The Angle Between The Tangent Line and Radius Vector For a Polar Curve - Slope of Tangent - Asymptotes - Plane Area.
30	General Applications

Recommended Books:

Text Books:

- Advanced Engineering Mathematics by Kreyszig.

Reference:

- Advanced Engineering Mathematics by Zill & Cullen.
- Introduction to Ordinary Differential equations by Ross.
- Introduction to Partial Differential equations by Sankara Rao.