SCHEME OF EXAMINATION w.e.f 2013-14
B.TECH. 2nd year Aeronautical Engineering -3rd Semester

Course No.	Course Title	Teaching Schedule				Examination schedule			Total Marks	Duration of Exam
		L	T	P/P	Total	Theory	Sessional	Practical		
HUM -201 E / MATH-201 E	Basic of Economics & Management/ Mathematics-III	3	1	-	4	100	50	-	150	3
ARE-201 E	Principle of Aerothermodynamics	3	1	-	4	100	50	-	150	3
ME-203E	Strength of Materials-I	3	1	-	4	100	50	-	150	3
ARE-203E	Introduction to Aero Communication	3	1	-	4	100	50	-	150	3
ME-207E	Kinematics of Machines	3	1	-	4	100	50	-	150	3
ARE-205E	Computer Programming and Network	3	1	-	4	100	50	-	150	3
ME-211 E	Kinematics of Machines Lab	-	-	3	3	-	50	50	100	3
ARE-207E	Aerothermodynamics Lab	-	-	2	2	-	50	25	75	3
ME-215E	Strength of Materials Lab	-	-	3	3	-	50	25	75	3
ARE-209 E	Computer Programming and Network Lab	-	-	3	3	-	25	25	50	3
	TOTAL	18	6	11	35	600	475	125	1200	-

B. Tech. (Third Semester) Aeronautical Engineering

Mathematics-III

MATH 201 E

L	T	P
3	1	-

Sessional	:	50 Marks
Theory	:	100 Marks
Total	:	150 Marks
Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT – I

Fourier series: Euler's Formulae, Conditions for Fourier expansions, Fourier expansion of functions having points of discontinuity, change of interval, Odd & even functions, Half-range series. Fourier Transforms: Fourier integrals, Fourier transforms, Fourier cosine and sine transforms. Properties of Fourier transforms, Convolution theorem, Perseval's identity, Relation between Fourier and Laplace transforms, Fourier transforms of the derivatives of a function, Application to boundary value problems.

UNIT-II

Functions of a Complex Variables: Functions of a complex variable, Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, limit and continuity of a function, Differentiability and analyticity. Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems, Conformal transformation, Standard transformations (Translation, Magnification & rotation,inversion & reflection, Bilinear).

UNIT-III

Probability Distributions : Probability, Baye's theorem, Discrete & Continuous probability distributions, Moment generating function, Probability generating function, Properties and applications of Binomial, Poisson and normal distributions.

UNIT-IV

Linear Programming : Linear programming problems formulation, Solution of Linear Programming Problem using Graphical method, Simplex Method, Dual-Simplex Method.

Text Book:

Higher Engg. Mathematics: B.S. Grewal
Advanced Engg. Mathematics: E. Kreyzig

References:

1. Complex variables and Applications: R.V. Churchil; Mc. Graw Hill
2. Engg. Mathematics Vol. II: S.S. Sastry; Prentice Hall of India.
3. Operation Research: H.A. Taha

B. Tech. (Third Semester) Aeronautical Engineering
Basic of Economics and Management

HUM -201 E

		Sessional	:	50 Marks
L	T	Theory	:	100 Marks
3	1	Total	:	150 Marks
		Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT-I

Meaning of Industrial Economics, production function, its types, least cost combination, law of variable proportions, law of returns: increasing, constant & diminishing.

Fixed & variable costs in short run & long run, opportunity costs, relation between AC & MC,U-shaped short run AC curve.

Price & output determination under monopoly in short run & long run, price discrimination, price determination under discrimination Monopoly, comparison between Monopoly & perfect competition.

UNIT-II

Meaning of management, characteristics of management, management Vs administration, management-Art, Science& Profession, Fayol's principles of management, Human relations approach, functions of management

UNIT – III

Planning & organizing: planning, steps in planning, planning premises, difference between planning policy & strategy, authority & responsibility, centralization & decentralization.

UNIT – IV

Staffing, Directing & Controlling-Manpower planning, recruitment & selection, styles of leadership, communication process and barriers, control process and steps in controlling.

TEXT BOOKS:

1. "Modern Economic Theory" Dewett, K.K., S. Chand & Co.
2. "Economic Analysis" K.P. Sundharam & E.N. Sundharam (Sultan Chand & Sons).
3. "Micro Economic Theory" M.L. Jhingan (Konark Publishers Pvt. Ltd.).
4. "Principles of Economics" M.L. Seth (Lakshmi Narain Aggarwal Educational Publishers – Agra).
5. "An Introduction to Sociology", D.R. Sachdeva & Vidya Bhusan.
6. "Society – An Introductory Analysis", R.M. Maclver Charles H. Page.
7. "Principles and Practices of Management : R.S. Gupta; B.D. Sharma; N.S. Bhalla; Kalyani.

REFERENCE BOOKS

1. "Organization and Management: R.D. Aggarwal, Tata McGraw Hill.
2. Business Organization and Management: M.C. Shukla

B. Tech. (Third Semester) Aeronautical Engineering
Principle of Aerothermodynamics
ARE- 201 E

L	T
3	1

Sessional	:	50 Marks
Theory	:	100 Marks
Total	:	150 Marks
Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT 1

Basic Concepts of Thermodynamics: Thermodynamics system, control volume, Properties, state, processes and cycle, equality of temperature, Zeroth Law of thermodynamics, temperature scale, laws of perfect gas, Pure substances, vapour-Liquid –solid-phase equilibrium in a pure substances, thermodynamic surfaces

UNIT 2

Principle of Work and heat, Law of conservation of mass and energy, First law of thermodynamics, steady state Processes, Second law of thermodynamics, Heat engine, Carnot cycle, thermodynamic temperature scale, entropy, change of entropy for different processes, equivalence of Kelvin plank and clausius statements, clausius inequality.

UNIT 3

General concept of Available and unavailable energy, availability of a non flow and steady flow system, Helmbeltz and Gibb's functions, Thermodynamic Relations: Important mathematical relations, Maxwell relations, Tds Relations, Joule- Thomson coefficient, Clayperon relation.

UNIT 4

Basic knowledge on Air – standard power cycle, Brayton cycle, Otto cycle, diesel cycle, Dual cycle, Stirling cycle, Ericssion cycle and Atkinson cycle, Mean effective pressure and efficiencies, Four stroke petrol and diesel engine, Two stroke Petrol and diesel engine.General study on properties of steam, phase change process, use of steam table & molier char. Rankine cycle, Reheat cycle, Regenerative cycle, cogeneration vapour compression refrigeration cycle.

Text Books:-

1. Engineering Thermodynamics – P K Nag, Tata McGraw Hill
2. Engineering Thermodynamics – C P Arora, Tata McGraw Hill

References:-

1. Theory and Problems of Thermodynamics – Y. V.C. Rao, Wiley Eastern Ltd., New Delhi.

2. Fundamentals of Engineering Thermodynamics – E. Radhakrishnan, PHI, New Delhi.

B. Tech. (Third Semester) Aeronautical Engineering
Strength of Materials –I

ME-203E

L	T	P
3	1	-

Sessional	:	50 Marks
Theory	:	100 Marks
Total	:	150 Marks
Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT- 1

Simple stresses & strains : Concept & types of Stresses and strains, Polson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical. Compound stresses & strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

UNIT- II

Shear Force & Bending Moments : Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexture under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii)combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems. Torsion of circular Members : Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

UNIT- III

Bending & shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with derivation combined bending torsion & axial loading of beams. Numericals. Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Eulers formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications eccentric compression of a short strut of rectangular & circular sections, Numerical.

UNIT- IV

Slope & Deflection : Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Text Books:

1. Strength of Materials – G.H.Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L.Singer, Addison – Wesley

References:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials A Rudimentary Apprach – M.A. Jayaram, Sapna Book House, Bangalore

B. Tech. (Third Semester) Aeronautical Engineering
Introduction to Aero Communication
ARE 203E

L	T	P
3	1	-

Sessional	:	50 Marks
Theory	:	100 Marks
Total	:	150 Marks
Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT – I

Theorical concept of Flight Instruments and Navigation Instruments – Gyroscope - Accelerometers, Air speed Indicators – TAS, EAS- Mach Meters - Altimeters - Principles and operation - Study of various types of engine instruments - Tachometers - Temperature gauges - Pressure gauges - Operation and Principles.

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UNIT-II

Principle of Conventional Systems - Power assisted and fully powered flight controls - Power actuated systems – Engine control systems - Push pull rod system, flexible push full rod system - Components - Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology, Communication and Navigation systems Instrument landing systems

UNIT– III

Basic knowledge on Mechanism, Instrument Panels - Displays - Layouts - Grouping details of:

i) Pitot instrument & systems.

ii) Primary flight instruments.

iii) Heading indicating instruments.

iv) Remote indicating systems.

v) Synchronous data transmission systems.

vi) Flight director & Flight data recording systems.

vii) ECAM/EICAS/EFIS - Their concepts, detailed description maintenance and practices.

ECAM - Electronic Central Aircraft Monitor.

EICAS - Engine Indicator Crew Alert Systems.

EFIS - Electronic Flight Instruments Systems

UNIT – IV

Basic Principles - Equipment - Power Sources - Airborne Navigational Equipment - VHF - ILS - DME - ADF - Radar & Doppler Navigation - Inertial Navigation, VOR, MLS (Microwave Landing System) Cockpit Voice Recorder (CVR), ELT (Emergency Locator Transmitter).

TEXT BOOKS:

1. Bent R.D. Mickinely, "Aircraft Maintenance and Repair ", 2nd Edition - McGraw Hill Inc.,New York, 1978.

2. Casamassa J.V. & Bent R., "Jet Aircraft Power Systems ", McGraw Hill Book Co., New York, 1975.

3. Adams H.W., "Aircraft Hydraulic ", McGraw Hill Book Co. Inc., New York, 1943

Eight questions are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Each question will be of equal marks.

B. Tech. (Third Semester) Aeronautical Engineering

Kinematics of Machines
ME 207 E

L	T	P
3	1	-

Sessional	:	50 Marks
Theory	:	100 Marks
Total	:	150 Marks
Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Kinematics, introduction to analysis and synthesis of mechanisms, Kinematics' pairs, Degree of freedom, Dynamitic chain mechanism, Machine, Four-bar chain, inversions, Single and double slider crank chain, Quick return mechanisms, Introduction to function generation, Path generation and rigid bodied guidance. Velocity determination; Relative velocity methods, Instantaneous center method Acceleration determination, Kennedy's Space cent rode and body cent rode,

UNIT II

Centripetal and tangential accelerations, Acceleration determination by graphical method using velocity polygons, Cariole's component of acceleration, Klein's and other constructions. Analytical methods to find velocity and acceleration of four –link mechanism, slider crank mechanism, freumdenstein's equation, Coordinate a angular displacements of input and output links (Path generation function generation), Least square technique, Rigid body guidance.

UNIT III

Pantograph, straight-line motion mechanisms (Peculiar, Hart, Scott Russell, Grasshopper, Watt, Kemp's Tchybishev, Parallel linkages) Indicator mechanisms (Simplex Crosby , Thomson, etc) Automobile steering gears (Davis and Ackerman),Hooks joint (universal coupling), Double hooks joints. Types of friction, Laws of dry friction, Motion along inclined plane Screw threads, Wedge, Pivots and collars, Plate and cone clutches, Antifriction bearings, friction circle and friction axis, bearings and lubrication. Motion along inclined plane and screws, Pivots and Collars Thrust Bearings lubrication

UNIT IV

Types of cams and followers, various motions of the follower, Construction of cam profiles, Analysis for velocities and accelerations of tangent and circular arc cams with roller and flat –faced followers. Open and crossed belt drives, velocity ratio, slip , material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts ratio 0f tensions, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drive, chain length, classification of chains

Text Books:

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications
2. Theory of Mechanism and Machines: Jagdish Lal, Metropolitan Book Co.
3. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.
4. Mechanism: J.S. Beggs.
5. Mechanics of Machines: P.Black, Pergamon Press.
6. Theory of Machines: P.L.Ballaney, Khanna Publisher.

B. Tech. (Third Semester) Aeronautical Engineering
Computer Programming and Network
ARE 205E

L	T	P
3	1	-

Sessional	:	50 Marks
Theory	:	100 Marks
Total	:	150 Marks
Duration of Exam.	:	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

Unit1

Computer Hardware and Software

Architecture of Computer System, different processors upto PIV systems. Computer Memory and different form of memories, RAM, Cache, secondary memory. Input/output devices and their functions.Client-server architecture of Operating Systems such as in Linux and Window operating Systems.

Unit 2

Basics of C++ Language :

Introduction to Objects and Object Oriented Programming and basic features of C++Language: various instructions, Encapsulation, inheritance, reusability and polymorphism.Introduction to Structures, abstraction, Classes: Const(Constant) Object And Const MemberFunctions, Object as Member of Classes, Friend Function and Friend Classes. Initializing Class Objects: Constructors, Using default arguments with Constructors, Using Destructors.

Unit 3

InheritanceBase Classes and Derived Classes, Protected Members, Casting Base- Class pointers to derived-Class pointers, Using Member Functions, Overriding Base –Class members in a Derived Class;public, protected and private Inheritance; Use of constructors and destructors in derived Classes.Creating sequential access files; Read, write and updating of sequential files.

Unit 4

Simple Programs using C++

Structure of a C++ program, simple problems of conditional and iterative statements.Basics of exceptional handling. Programs based on inheritance and exception handling.

Computer Networks & Security

Introduction to Computer Networks, Example networks ARPANET, Private Networks,Network Topologies: Bus-, Star-, Ring-topologies. Types of Networks : Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model and functions of each layer; Services and Protocols of each layer.Network security: Various Network security threats: Viruses, Worms, Trojan horses, spam emails. Security techniques: passwords, cryptography, firewalls, anti-viruses.

Text Books:

1 Object Oriented Programming with C++ by E Balagurusanry
2 Computer Fundamentals by PK Sinha

References:

1 Object Oriented Programming i C++ by Robert Lafone
2 Computer Networking by Tanenbaun, PHI.
3. Computer Architecture and Prganisation by Morris Mano.
4. Computer Networking a Top Down Approach featuring the internet- James F Kurose.

B. Tech. (Third Semester) Aeronautical Engineering
Kinematics of Machines Lab
ME 211 E

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory

L	T	P
-	-	3

Sessional : 50 Marks
Practical : 50 Marks
Total : 100Marks
Duration of Exam : 3 Hrs.

List of experiments

1. To determine the modulus of rigidity of the material of a closed coil helical spring and the stiffness of a spring
2. To determine the value of coefficient of friction for a given pair of surfaces using friction apparatus
3. To determine the modulus of rigidity of horizontal shaft
4. To determine experimentally the ratio of the cutting time to idle time (cutting stroke to idle stroke) of the crank and slotted lever (QRM)/ Whitworth and compare the result to theoretical values plot the following
   a. θ v/s X (displacement of slider).
   b. θ v/s velocity.
   c. θ v/s Acceleration and to compare the values of velocities
   (Take angles θ =45˚, 90˚, 135˚, 225˚, 270˚ &335˚, ω = 1 rad/s)
5. To determine the value of coefficient of friction between the screw and nut of the jack, while:
   a. Raising the load
   b. Lowering the load
6. To draw experimentally a curve of the follower-displacement v/s cam-angle. Differentiate the above curve to get velocity and acceleration plot and compare the values with those obtained analytically.
7. To determine the coefficient of friction between belt and pulley and plot a graph between $\log_{10} T_1/T_2$ v/s, θ.
8. To determine the displacement, velocities, & accelerations of the driven shaft of a Hooke's joint for a constant speed of the driver shaft.
9. To determine velocity & acceleration of slider in slider-crank mechanism and plot the following:
   a. θ v/s x (displacement of slider)
   b. θ v/s velocity and
   c. θ v/s acceleration.

   Compare the values of velocities & acceleration with those obtained theoretically.(Assume ω=I rad/sec.).
10. Study of the inversions of the single slider crank mechanism.
11. To verify the law of moment using Bell- crank lever.

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B. Tech. (Third Semester) Aeronautical Engineering
Aerothermodynamics Lab
ARE-207 E

L	T	P
-	-	2

Sessional	: 50 Marks
Practical	: 25 Marks
Total	: 75 Marks
Duration of exam	: 3 Hrs.

List of Experiments

1. Performance test on a 4-stroke engine.
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine.
3. Determination of effectiveness of a parallel flow heat exchanger.
4. Determination of effectiveness of a counter flow heat exchanger.
5. Determination of the viscosity coefficient of a given liquid.
6. COP test on a vapour compression refrigeration test rig.
7. COP test on a vapour compression air-conditioning test rig.
8. Study of a Gas Turbine Engine.
9. Determination of Conductive Heat Transfer Coefficient.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

Strength of Materials Lab
ME-215E

L	T	P
-	-	3

Sessional	: 50 Marks
Practical	: 25 Marks
Total	: 75 Marks
Duration of exam	: 3 Hrs.

List of Experiments:

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the erichsen sheet metal testing machine & perform the erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the sheer test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Wheel.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. (Third Semester) Aeronautical Engineering
Computer Programming & Network Lab

ARE-209E

L	T	P
-	-	3

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration of exam: 3 Hrs.

The students are required to do Practical on the following:

(i) Computer Hardware:

1. To identify various parts of the system on the Mother Board.
2. To observe and study various cables, connections and parts used in computer communication.
3. To study various cards used in a system viz. display card, LAN card etc.
4. To study laser printer assembly and elementary fault detection.
5. To assemble a PC.
6. Simple trouble shooting exercises related to various components of computer like monitor, drives, memory and printers etc
7. Loading of Computer Software

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(ii) Computer Software:

1. Practice of MS-Excel for drawing tables, graphs, bar-chart etc. To prepare the list of marks obtained by students in different subjects and show with the help of chart/graph the average, min and max marks in each subject.
2. Practice of using MS-Access for data storage and databases and use this database in the programs. Create a database of books in the library on a mini scale with respect to Computers and manipulate the database using different forms and reports.
3.Using MS Power Point prepare a presentation explaining the facilities/infrastructure available in your college/institute.

(ii) Computer Programming in C++:

Simple Programs using C++ language such as

1. Using C++ write program for (i) addition of matrices, (ii) multiplication of matrices,(iii) norm of matrices.
2. Sort an array of numbers/ names using different sorting methods.
3. searching a given number in an array using sequential or binary search or pick different numbers in an array which satisfy given conditions
4. Prepare result of an examination and print the marks-sheets develop program for inventory system.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.