Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Syllabus for B.E. (Fifth Semester) Aeronautical Engineering

Heat Transfer (BEAE-501T)

(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**
Duration of University Exam: 03 Hours

Unit – I **7 Hours**

Introduction: Basic modes of heat transfer, conduction, convection and radiation, Laws of heat transfer and conservation of energy requirement.

Heat Conduction – One dimensional steady state heat conduction: Composite Medium – Critical thickness – Effect of variation of thermal Conductivity – Extended Surfaces – Unsteady state. Lumped System Analysis – Heat Transfer in Semi infinite and infinite solids – Use of Transient – Temperature charts– Biot Number,

Unit – II **7 Hours**

Free Convection:

Free or natural convection, Grashof number, Rayleigh number, Horizontal and vertical plate. Empirical co-relations for cylinders and spheres. Heat transfer with phase change, pool boiling curve & regimes of pool boiling. Film & Drop wise condensation, laminar film condensation on vertical surface, film condensation on horizontal tubes, effect of super heated & non-condensable gasses on condensation heat transfer, Introduction to heat pipe.

Unit – III **7 Hours**

Forced convection:

Physical significance of non-dimensional parameters. Flow of high moderate & low prandtl number, fluid over flat surface. Concept of velocity & thermal boundary layer thickness, local and average heat transfer coefficients. Empirical co-relations for external, internal flow, laminar & turbulent flow through conduits.

Unit – IV **8 Hours**

Radiative Heat Transfer

Radiation, nature of thermal radiation, black body radiation, radiation intensity, laws of radiation– Kirchoffs, Planks, Weins displacement, Stefan Boltzmann & Lamberts Co-sine law. Emissivity, Absorbtivity, Transmissivity, Reflectivity, Radiosity, Emissive power, irradiation. Radiation network, radiation exchange between surfaces, idea of shape factor & reciprocity theorem, radiation between parallel plates, cylinder & spheres. Radiation shields, effect of radiation on temperature measurement.

Unit – V **8 Hours**

HEAT EXCHANGERS

Heat Exchanger :- Classification, Overall heat transfer coefficient, fouling factor, LMTD method of heat exchange analysis for parallel, counter flow & cross flow arrangement. Effectiveness NTU method, heat exchanger analysis by NTU method, design aspects of heat exchangers. Introduction to compact heat exchanger. Introduction to mass transfer.

Unit – VI **8 Hours**

HEAT TRANSFER PROBLEMS IN AEROSPACE ENGINEERING

High-Speed flow Heat Transfer, Heat Transfer problems in gas turbine combustion chambers – Rocket thrust chambers – Aerodynamic heating – Ablative heat transfer.

Total No of periods: 45

TEXT BOOKS:

1. Introduction to heat Transfer Incropera. F.P.and Dewitt.D.P. ,John Wiley and Sons – 2002.
2. Elements of Heat Transfer M. N. Ozisik
3. Heat Transfer -A practical approach Yunus A. Cengel , "Tata Mcgraw Hill publication Second Edition
4. Heat Transfer J. P. Holman McGraw Hill Publication

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Syllabus for B.E. (Fifth Semester) Aeronautical Engineering

Aircraft Flight Mechanics (BEAE-502T)

(Total Credits: 05)

Teaching Scheme **Examination Scheme**

Lectures: 4 Hours/ Week **Theory**
Tutorial: 1 Hours / Week **T (U): 80 Marks** **T (I): 20 Marks**
Duration of University Exam: 03 Hours

Unit- I Introduction and background **6 hours**

Dimensional analysis, Buckingham Pi theorem-applications-similarity laws and models International Standard Atmosphere

Unit-II: FORCES AND MOMENTS ON THE AIRPLANE **10 hours**

Forces and moments acting on a flight vehicle - Equation of motion of a rigid flight vehicle - Different types of drag - Drag polars of vehicles from low speed to high speeds - Variation of thrust, power and SFC with velocity and altitudes for air breathing engines and rockets - Power available
and power required curves.

AIRCRAFT PERFORMANCE

Unit-III **8 Hours**

Performance of airplane in level flight - Maximum speed in level flight - Conditions for minimum drag and power required - Range and endurance, - Climbing flight (Maximum rate of climb and steepest angle of climb,) Service and absolute ceiling

Unit –IV **7 Hours**

Gliding flight (minimum rate of sink and shallowest angle of glide) Turning performance (Turning rate turn radius). Bank angle and load factor, take off and landing performance - Limitations of pull up and push over

STATIC LONGITUDINAL STABILITY

Unit-V **7 Hours**

Degree of freedom of rigid bodies in space - Static and dynamic stability - Purpose of controls in airplanes -Inherently stable and marginal stable airplanes – Static, Longitudinal stability - Stick fixed stability - Basic equilibrium equation - Stability criterion

Unit-VI **7 Hours**

Effects of fuselage and nacelle - Influence of CG location - Power effects - Stick fixed neutral point - Stick free stability-Hinge moment coefficient - Stick free neutral points-Symmetric maneuvers - Stick force gradients - Stick _ force per 'g' - Aerodynamic balancing. Determination of neutral points and maneuver points from flight test.

Total No of periods: 45

TEXT BOOK

1. Perkins, C.D., and Hage, R.E., “Airplane Performance stability and Control”, John Wiley & Son:,
   Inc, New York, 1988.

REFERENCES

1. Etkin, B., “Dynamics of Flight Stability and Control”, Edn. 2, John Wiley, New York, 1982
2. Babister, A.W., “Aircraft Dynamic Stability and Re¬sponse”, Pergamon Press, Oxford, 1980.
3. Dommasch, D.O., Shelby, S.S., and Connolly, T.F., “Aeroplane Aero dynamics”, Third Edition,
   Issac Pitman, London, 1981.
4. Nelson, R.C. “Flight Stability and Automatic Control”, McGraw-Hill Book Co., 1998.

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Fifth Semester) Aeronautical Engineering

Aerodynamics- II (BEAE-503T)

(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week
Duration of University Exam: 03 Hours

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**

UNIT – I **7 Hours**

Description of flow past a wing - Streamline pattern, formation of tip vortices - Down wash - Induced angle of attack and induced drag - Momentum theory of wing for lift and induced drag - Schrenk's method of estimation of wing characteristics from airfoil data.

UNIT – II **8 Hours**

Representation of lifting effect of wing by vortex lines - Lifting line theory - Formulation of governing integro - Differential equation - Method of solution by Fourier series - Effect of Individual terms of the series (first 3 terms) - Effect of taper twist and sweep back - Influence of flaps on wing lift distribution.

UNIT – III **8 Hours**

Extended lifting theory - Low aspect ratio wings - Jones theory - Winglets and strakes - Flow past slender bodies of revolution - Lift, drag and moment characteristics of complete airplane.

Unit – IV **8 Hours**

Shock expansion method for flow over airfoils - small perturbation equation for compressible flow - Glauret and Geothert's rules - Ackert's supersonic airfoil theory - Three dimensional thin wings in supersonic flows - Perturbation potential - Non-lifting wings - Lifting wings of simple plan form - Conical flows - Numercial integration procedures - Drag at supersonic speeds - Supersonic area rule.

Unit – V **7 Hours**

Principles of model testing - Types of subsonic wind tunnels - Balances and measurements - Interference effects - transonic, Supersonic and hypersonic wind tunnels and characteristic features, their operation and performance - Shock tubes and shock tunnels

Unit-VI **7 Hours**

Free flight testing - Measurements of pressure, velocity and Mach number - Flow visualisation methods of subsonic and supersonic flows.

Total No of periods: 45

TEXT BOOKS:

1. CLANCY J., " Aerodynamics ", Pitman, 1986.
2. HOUGHTON and CARUTHER, " Aerodynamics for engineering students ", Edward Arnold Publishers, London, 1989.
3. ANDERSON J.D., " Fundamental of Aerodynamics ", McGraw Hill Book Co., New York, 1985.
4. ALLEN POPE, " Low Speed Wind Tunnel Testing ", Vol. I - John Wiley & Sons Inc., New York, 1966.
5. ALLEN POPE, " High Speed Wind Tunnel Testing ", Vol. II - John Wiley & Sons Inc., New York, 1966.
6. McCORNICK. W., " Aerodynamics, Aeronautics and Flight Mechanics ", John Wiley, New York, 1979.

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Fifth Semester) Aeronautical Engineering

Aircraft Structure- II (BEAE-504T)

(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week
Duration of University Exam: 03 Hours

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**

Unit – I: Unsymmetrical Bending **8 Hours**
Review of bending of symmetrical sections, Stresses in beams of unsymmetric sections

Unit – II: Shear Flow in Open Sections **8 Hours**
Thin walled beams, Concept of shear flow, shear centre, Elastic axis.
Shear Flow in Closed Sections

Unit – III: **7 Hours**
Membrane Analogy , Bredt - Batho formula, Single and multi-cell structures. Shear flow in single and multicell structures under torsion.

Unit – IV: **7 Hours**

Shear flow in single and multicell under bending with walls effective and ineffective.

Unit – V Buckling of Plates **7Hours**

Rectangular sheets under compression, Local buckling stress of thin walled sections, Crippling stresses by Needham's and Gerard's methods, Thin walled column strength. Sheet stiffener panels. Effective width, Inter rivet and sheet wrinkling failures.

Unit – VI: Stress Analysis of Wing and Fuselage **8 Hours**

Procedure - Shear and bending moment distribution for semi cantilever and other types of wings and fuselage, thin webbed beam. With parallel and non parallel flanges, Shear resistant web beams, Tension field web beams (Wagner's).

Total No of periods: 45

REFERENCES*:*

1. Megson, New edition T.M.G., "Aircraft Structures for Engineering Students", Edward Arnold, 1985.
2. Bruhn. E.H, "Analysis and Design of Flight vehicles Structures", Tri-state off set company, USA, 1965.
3. Peery, D.J., and Azar, J.J, "Aircraft Structures ", 2nd edition, Mcgraw-Hill, N.Y., 1993.
4. Rivello, R.M., "Theory and Analysis of Flight Structures ", McGraw Hill, 1993.

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Syllabus for B.E. (Fifth Semester) Aeronautical Engineering

Aircraft Structure- II (BEAE-504P)

(Total Credits: 01)

Teaching Scheme	**Examination Scheme**	
Practical: 2 Hours/ Week	**Practical**	
	T (U): 25 Marks	**T (I): 25 Marks**

List of Experiments in Aircraft Structures-II

1. Determination of Unsymmetrical bending using different section using bend test set up.
2. Determination of Shear centre location for open sections
3. Determination of Shear centre location for closed sections
4. Experiment on Constant strength beam
5. Finding out flexibility matrix for cantilever beam
6. Testing of Beam with combined loading
7. Determination of resonance frequency of Beams using free vibrations
8. Determination of resonance frequency of Beams using forced vibrations
9. Column testing and Southwell plot
10. Verification of Maxwell’s Reciprocal theorem & principle of superposition

Engineering and Technology
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Fifth Semester) Aeronautical Engineering
Propulsion- I (BEAE-505T)
(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**
Duration of University Exam: 03 Hours

Unit-I: Fundamentals of Gas Turbine Engines **8 Hours**

Illustration of working of gas turbine engine - The thrust equation - Factors affecting thrust - Effect of pressure, velocity and temperature changes of air entering compressor - Methods of thrust augmentation - Characteristics of turboprop, turbofan and turbojet - Performance characteristics.

Unit-II: Subsonic and Supersonic Inlets for Jet Engines **7 Hours**

Internal flow and Stall in Subsonic inlets - Boundary layer separation - Major features of external flow near a subsonic inlet - Relation between minimum area ratio and eternal deceleration ratio. Inlet Diffuser performance - Supersonic inlets - Starting problem in supersonic inlets - Shock swallowing by area variation – External deceleration - Modes of inlet operation.

Unit-III: Combustion Chambers **8 Hours**

Classification of combustion chambers - Important factors affecting combustion chamber design – Combustion process - Combustion chamber performance - effect of operating variables on performance - Flame tube cooling - Flame stabilization - Use of flame holders - Numerical problems.

Unit-IV: Nozzles **7 Hours**

Theory of flow in isentropic nozzles - Convergent nozzles and nozzle choking - Nozzle throat conditions - Nozzle efficiency - Losses in nozzles - Over expanded and under-expanded nozzles - Ejector and variable area nozzles - Interaction of nozzle flow with adjacent surfaces - Thrust reversal.

Unit-V: Compressors & Turbines **8 Hours**

Description Classification, type, performance parameters – efficiency, component characteristics.

Unit – VI: Matching of Gas Turbine Components: **7 Hours**

Inlet, compressor, combustion chamber, turbine, and nozzle. Numerical problems.

Total No of periods: 45

REFERENCES:

1. Hill, P.G & Peterson, GR. “Mechanics of Thermodynamics of Propulsion” Addison – Wesley Longman JNC, 1999.
2. Cohen, H.Rogers, G.F.C. and Saravanamuttoo, H.I.H. " Gas Turbine Theory ", Longman, 1989.
3. Mathur, M.L., and Sharma, R.P.,"Gas Turbine", "Jet and Rocket Propulsion", Standard Publishers and Distributors, Delhi, 1988.
4. Oates, G.C. " Aerothermodynamics of Aircraft Engine Components ", AIAA Education Series, New York, 1985.

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Fifth Semester) Aeronautical Engineering

Non Destructive Inspection (BEAE-506P)
(Total Credits:02)

Teaching Scheme	**Examination Scheme**	
Practical: 2 Hours/ Week	**Practical**	
	T (U): 25 Marks	**T (I): 25 Marks**

Objective:

The training will have a focus on creating awareness of various non destructive techniques such as ultrasonic, radiography, dye penetration etc. for determination of defects / damage in structural component for maintenance.

List of Experiments for Non Destructive Inspection:

1. Simple optical inspection
2. Borescope
3. Ultrasonic flaw detection
4. Ultrasonic thickness measurement
5. Dye Penetration testing
6. Eddy current testing
7. Magnetic particle testing
8. Radiography
9. Weld inspection
10. Metallurgical Microscope

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Fifth Semester) Aeronautical Engineering
CAD/ CAM (BEAE-507P)
(Total Credits: 02)

Teaching Scheme	**Examination Scheme**	
Practical: 2 Hours/ Week	**Practical**	
	T (U): 25 Marks	**T (I): 25 Marks**

List of Experiments in Computer Aided Design
(Any Ten Practicals)

1. Introduction to CAD Software's, tools, Menu Commands and shortcut keys.
2. Program to generate Line, Circle using Bresenham's principle Algorithm and one Numerical on two dimensional transformations and three dimensional transformations.
3. Program for generation of any one synthetic curve surface (Bezeier or B-spline)
4. Scaling, rotation, translation, editing, dimensioning – Typical CAD command
5. Structure.
6. Wire frame modeling – surface modeling
7. Solid Modeling & Advanced modeling
8. Flow Simulation Over A Symmetrical Airfoil Using CFD
9. Flow Simulation Over A Cambered Airfoil Using CFD
10. Flow Simulation Over A Turbine Blade(static analysis)Using CFD
11. Stress Analysis Of A Turbine Blade (Rotation only and no pressure loads)
12. Stress Analysis Of Any Aircraft Component
13. Analysis of Truss & 2- dimensional problem of finite element method using Ansys or any analysis software.
14. Analysis of Beam and Axisymmetric problem of finite element method using Ansys or any analysis software.
15. Analysis of any one Heat conduction problem of finite element method using Ansys or any analysis software.

List of Software's:
CAD: Pro/E, NX-5, Catia, Solid Edge
CAE: Anysys. Cosmos, Hypermesh, Nisa

Turbo C

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Syllabus for B.E. (Sixth Semester) Aeronautical Engineering

Propulsion- II (BEAE-601T)

(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**
Duration of University Exam: 03 Hours

Unit-I: Ramjet Propulsion **7 Hours**

Operating principle - Subcritical, critical and supercritical operation - Combustion in ramjet engine– Ramjet performance - Sample ramjet design calculations.

Unit-II: Scramjet and Hypersonic Propulsion **7 Hours**

Introduction to scramjet - Preliminary concepts in supersonic combustion - Integral ram - rocket - Numerical problems, Hypersonic propulsion.

Unit-III FUNDAMENTALS OF ROCKET PROPULSION **7 Hours**

Operating principle - Specific impulse of a rocket - internal ballistics - Rocket nozzle classification – Rocket performance considerations - Numerical problems.

Unit-IV SOLID PROPELLENTS **8 Hours**

Solid propellant rockets - Selection criteria of solid propellants - Important hardware components of solid rockets - Propellant grain design considerations.

Unit-V LIQUID PROPELLANT **8 Hours**

Selection of liquid propellants – Thrust control in liquid rockets - Cooling in liquid rockets - Limitations of hybrid rockets - Relative advantages of liquid rockets over solid rockets - Numerical problems.

Unit-VI ADVANCED PROPULSION TECHNIQUES **8 Hours**

Electric rocket propulsion - Ion propulsion techniques - Nuclear rocket - Types -Solar sail - Preliminary Concepts in nozzle less propulsion.

Total No of periods: 45

REFERENCES:

1. Sutton, G.P & Oscar Bilbraz,., "Rocket Propulsion Elements", John Wiley & Sons Inc., New

York, 7th Edition,2004
2. Gorden, C.V., "Aerothermodynamics of Gas Turbine and Rocket Propulsion ", AIAA Education Series, New York, 1986.
3. Mukunda H. S . " Understanding Aerospace chemical propulsion ",Interline publications ,2004

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Syllabus for B.E. (Sixth Semester) Aeronautical Engineering

Propulsion- II (BEAE-601P)

(Total Credits: 01)

Teaching Scheme	**Examination Scheme**	
Practical: 2 Hours/ Week	**Practical**	
	T (U): 25 Marks	**T (I): 25 Marks**

List of Experiments in Propulsion- II:

1. Subsonic free /wall jet apparatus
2. Subsonic Free/wall jet with open section wind tunnel
3. Supersonic free jet apparatus
4. Propeller performance test apparatus
5. Aircraft engines models/cut section
6. Cascade Test setup
7. free/forced convective heat transfer test setup
8. Study of magneto and ignition system
9. Study of combustion characteristics

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Syllabus for B.E. (Sixth Semester) Aeronautical Engineering

Manufacturing Process- II (BEAE-602T)

(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**
Duration of University Exam: 03 Hours

Unit – I **6 Hours**

Theory of metal cutting : Mechanics of Metal Cutting, Orthogonal and oblique cutting, Stress, Strain & Cutting Forces, Merchant Circle,

Unit – II **7 Hours**

Cutting Force Calculations, Determination of Torque and Power Required for Turning, Drilling and Milling, Influence of tool angle, Cutting Fluids, Cutting speed, Feed and depth of cut on power requirement, Estimation of tool life.

Unit – III **8 Hours**

Study of construction , working , accessories and operations of (1) Lathes (ii) Drilling (iii) Milling Machines (IV) Capstan & Turret Lathe

Unit – IV **8 Hours**

Press Working : Die cutting operation, classification, types of presses, press terminology, introduction to shaping operations, bending, forming & drawing.

Jigs and Fixtures : Introduction, principles of jigs and fixtures design. Materials, principles of location, methods of location. Clamping requirements, types of clamps, jig bushes, drilling jigs, milling fixtures, classification of fixtures.

Manufacturing process of special interest for Aerospace application

Unit – V **8 Hours**

Joints , Rivets , Non-conventional Machining Processes :- Characteristics, Operation, Applications, Limitations and Selection of Process Parameters of the following Processes. Abrasive Jet Machining, Ultrasonic Machining, Water Jet Machining, EDM, ECM.

Unit – VI **8 Hours**

Advanced Welding Methods :- Introduction to TIG, MIG, Spot Welding, Plasma Arc Welding. Electron Beam Welding, Laser Beam Welding.

Total No of periods: 45

TEXT BOOKS:

1. Production Technology - R.K. Jain,8th Edn, Khanna Pub.

2.	Modern Machining Processes	–	Pandey, Shah, Tata McGraw Hill
3.	Production Engineering	–	P. C. Sharma.
4.	Tool Design	–	Donaldson, Tata McGraw Hill

REFERENCE BOOKS :-

1.	Work Shop Technology , Vol. I - III	- WAJ Chapman.
2.	Manufacturing Processes	- M. Begman
3.	Processes & Materials of Manufacture	- R. Lindberg.
4.	Work Shop Technology (Volume - I & II)	- Bawa
5.	Work Shop Technology (Volume - I & II)	- B. S. Raghuvanshi

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Sixth Semester) Aeronautical Engineering
System Modeling and Simulation (BEAE-603T)
(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week

Examination Scheme
Theory
T (U): 80 Marks T (I): 20 Marks
Duration of University Exam: 03 Hours

Unit – I **7 Hours**

Mathematical Modeling of Physical System and Concept of Transfer Function system Representation through Block Diagram and Signal Flow Graph. Transfer friction through Block

Diagram Simplification and Mason's Gain Formula.

.**Unit – II** **6 Hours**

System Models: Concept of a system, system environment, stochastic activities continuous & discrete system, system modeling, type of models static physical models, dynamic physical models,static & dynamic mathematical models, principles used in modeling.

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Unit – III **7 Hours**

System Studies: Subsystems, a corporate model,types of system study, system analysis design & postulation.

Unit – IV **8 Hours**

Control System Components such as hydraulic actuators, Servomechanism D.C. and liquid level control, Automobile Power Steering Control, Speed Control, Position control of Robotic Manipulator Etc.

Unit –V **9 Hours**

Use of computer based simulation package such as Mat lab simulink. .

Unit – VI **8 Hours**

Typical Navigational systems- - Integrated Avionics system, Avionic sub system

Total No of periods: 45

TEXT BOOKS:

1. System Simulation second Edition by Geoffrey Gordon (PHI Pub.)
2. System Simulation with Digital Computer by Narsingh Deo (PHI Pub.)

REFERENCE BOOKS:

1. "System Simulation" the Art & Science by Shannon R.E.(PHI Pub.)
2. The Application of GPSS to Discrete System Simulation by Gorden. Englewood Cliffs (PHI)

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Sixth Semester) Aeronautical Engineering
Applied Electronics (BEAE-604T)
(Total Credits: 05)

Teaching Scheme	**Examination Scheme**
Lectures: 4 Hours/ Week	**Theory**
Tutorial: 1 Hours / Week	**T (U): 80 Marks T (I): 20 Marks**

Duration of University Exam: 03 Hours

Unit I **6 Hours**

Digital Computers, Memory Classification, Architecture of 8085 Microprocessor, Interfacing of memories/latches/buffers /leds/7-segment display/pushbutton/switches.

Unit II **9 Hours**

Addressing Modes, Instruction Set Classification, Simple Instructions with programs for data transfer, arithmetic, logical , branching and machine control ,Stacks and subroutines , simple and nested calls and return.

Unit III **10 Hours**

Code conversion ,BC D arithmetic and 16 bit data handling instructions and programs, Formats of data transfer, Interrupts (hardware and software). Serial data communication using SID and SOD pins.

Unit IV **8 hours**

Programmable peripheral interface(PPI) 8255, architecture, interfacing and different modes,Interfacing of keyboards/leds/7-segment display/pushbutton/switches using 8255, Interfacing of matrix keyboard, multiplexed 7- segment displays, stepper motors, ADC and DAC.Bus contention and slow memories interfacing

Unit V **6 Hours**

Introduction: Importance and role of avionics, avionic environment, Displays and man-machine interaction: Head up displays, intelligent displays management, Displays technology, control and data entry, instrument placement .

Unit VI **6 Hours**

Onboard communications: Microphones, Digital communications, Transmission lines, Digital data bus systems ARINC 426, MIL STD 1553, Commercial standard digital bus, Fiber optic communication Avionics system integration: Data bus systems, integrated modular avionic

Total No of periods: 45

TEXT BOOKS:

1. Microprocessor architecture programming and applications with 8085: Ramesh Gaonkar

2. Microprocessor architecture and programming: D.V.Hall
3. Microprocessor and programming : Vibhute and Borle
4. Introduction to Avionics : Collins on RPG, , Second Edition, Kluwer Academic Publishers, Chapman & Hall, 2003.
5. Principals of Avionics: Albert Helfrick, 2nd Edition, Avionics Communication Inc.
6. Avionics Systems: Middleton, D.H., Ed., Longman Scientific and Technical, Longman Group UK Ltd., England, 1989.
7. Manual of Avionics: Brain Kendal, The English Book House, 3rd Edition, New Delhi, 1993.

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Sixth Semester) Aeronautical Engineering
Applied Electronics (BEAE-604P)
(Total Credits: 01)

Teaching Scheme
Practical: 2 Hours/ Week

Examination Scheme
Practical
T (U): 25 Marks **T (I): 25 Marks**

List of Experiments for Applied Electronics

Sr.No.	Aim
1.	Introduction of 8085 kit
2.	Write an ALP to add two 16 bit numbers and store the result in memory location
3a.	Write an ALP to transfer 8 bytes of data from one memory location to another when these parts are not overlapping.
3b.	Write an ALP to transfer 8 bytes of data from one memory location to another when these parts are overlapping.
4.	Write an ALP to calculate sum of 8 bytes stored in memory from D000H.
5a.	Write an ALP to count the No. of even as well as odd No. in a given set of Nos.
5b.	Write an ALP to count the No. of Positive as well as Negative No. in a given set of Nos.
6a.	Write an ALP to find the smallest No. from the given set of 10 Nos.
6b.	Write an ALP to find the largest No. from the given set of 10 Nos.
7a.	Write an ALP to sort the given series in Ascending order.
7b.	Write an ALP to sort the given series in Descending order.
8.	Write an ALP to exchange the contents of two memory blocks.
9.	Write an ALP to perform multiplication of two 8 bit numbers using 8085 simulator.
10.	To study the interfacing of traffic controller using 8255.
11.	To study the interfacing of stepper motor with 8085.

Engineering and Technology

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Sixth Semester) Aeronautical Engineering
Aircraft Design (BEAE-605T)
(Total Credits: 05)

Teaching Scheme
Lectures: 4 Hours/ Week
Tutorial: 1 Hours / Week
Duration of University Exam: 03 Hours

Examination Scheme
Theory
T (U): 80 Marks **T (I): 20 Marks**

Unit I: Introduction **6 Hours**

Airplane design process – conceptual, preliminary & detail design phases, Classification of airplanes based on purpose and configuration, Factors affecting configuration, Merits of different airplane layouts

Unit II: Shaping the Airplane **8 Hours**

Principal features, Aerodynamic consideration, Lift, Drag and Interference effects, Weights and Strength considerations, Peculiarities in layout, Designing for manufacturability, Maintenance, Operational costs, Interactive design

Unit III: Conceptual Design Procedure **10 Hours**

Data collection and 3-View drawings, their purpose, initial sizing - weight estimation, choice of wing loading and thrust loading, rubber engine sizing, fixed engine sizing. Constraint analysis. Power plant selection - Choices available, Comparative merits, Location of power plants, Functions dictating the locations

Unit IV: Design of Major Airplane Components – I **7 Hours**

Wing design: Airworthiness requirements, V-n diagram, loads, Elements of wing design, Structural features.

Unit V: Design of Major Airplane Components – II **7 Hours**

Fuselage design: Loads on fuselage, Elements of fuselage design, Determination of tail surface areas, Structural features.

Unit VI: Design of Major Airplane Components – III **7 Hours**

Landing gear design: Loads or Landing gear, Preliminary landing gear design.

Total No of periods: 45

REFERENCES:

1. Torenbeek, E., "Synthesis of Subsonic Airplane Design", Delft University Press, U.K.1986

2. Kuechemann, D., "Aerodynamic Design of Aircraft", Pergamon Press,1978
3. Raymer, D.P., “Aircraft Conceptual Design", AIAA Series, 1989s
4. Bruhn E F, Design and Analysis of Flight Vehicle Structures, Tri-state Offset Press,

Engineering and Technology
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Syllabus for B.E. (Sixth Semester) Aeronautical Engineering
Seminar (BEAE-606P)
(Total Credits: 02)

Teaching Scheme	**Examination Scheme**	
Practical: 2 Hours/ Week	**Practical**	
	T (U): 25 Marks	**T (I): 25 Marks**

This will be train the student to search literature on selected topic, understand research papers on the topic, summarize and extract material. Prepare a report on his / her own and make a presentation