SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

8th Semester Syllabus - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Bachelor of Engineering (Aeronautical Engineering)

AEA-801 Finite Element Methods

AEA-801	Finite Element Methods	3L:0T:0P	3 Credits	3Hrs/Week

Course Preamble:

- To give exposure various methods of solution and in particular the finite element method.
- Gives exposure to the formulation and the procedure of the finite element method and its application to varieties of problems.

Couse Outcomes:

- Write flow chart of finite element steps and understand the convergence of the problem
- Solve stiffness matrix for bar, beam and frame problems using suitable boundary condition.
- Plane stress and plane strain condition are used to understand 2d structures.
- Apply the concepts of finite element methods to solve fluid flow and heat transfer problems.

Unit 1: Introduction (10 Hours)

Review of various approximate methods – variational approach and weighted residual approach application to structural mechanics problems. finite difference methods- governing equation and convergence criteria of finite element method.

Unit 2: Discrete Elements (10 Hours)

Bar elements, uniform section, mechanical and thermal loading, varying section, 2D and 3D truss element. Beam element - problems for various loadings and boundary conditions – 2D and 3D Frame elements - longitudinal and lateral vibration. Use of local and natural coordinates.

Unit 3: Continuum Elements (10 Hours)

Plane stress, plane strain and axisymmetric problems. Derivation of element matrices for constant and linear strain triangular elements and axisymmetric element.

Unit 4: Isoperimetric Elements (10 Hours)

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, stiffness matrix and consistent load vector, evaluation of element matrices using numerical integration.

Unit 5 : Field Problem and Methods of Solutions (10 Hours)

Heat transfer problems, steady state fin problems, derivation of element matrices for two dimensional problems, torsion problems. bandwidth- elimination method and method of factorization for solving simultaneous algebraic equations – Features of software packages, sources of error.

Reference:

- An Introduction to the Finite Element Method, Reddy J.N., Tata McGraw-Hill, New Delhi.
- Concepts & Applications of Finite Element Analysis, Cook, Malkus, Plesha and Witt, Willey India, New Delhi.
- Introduction to Finite Elements in Engineering, Chandupatla and Belegundu, Prentice Hall.

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AEA-801	**Finite Element Methods**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

List of Experiments:

- Write flow chart of finite element steps.
- Study and understand the convergence of the problem.
- Solve stiffness matrix for bar, beam and frame problems using suitable boundary condition.
- Plane stress and plane strain condition are used to understand 2d structures.
- Analysis of beams and frames (bending problems)
- Analysis of beams and frames (torsion problems)
- Nodal analysis problem.
- Heat transfer problems.
- Problems leading to analysis of three dimensional solids.
- Problems leading to analysis of axisymmetric solids.

Lab Outcome:
Student can able to do the coding for heat transfer analysis, structural analysis and make simulation for various structures.

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Program Elective-V

AEA-802 (A) Avionics

AEA-802 (A)	**Avionics**	**3L:0T:1P**	**3 credits**	**3Hrs/Week**

Course Preamble:

- To introduce the basic of avionics and its need for civil and military aircrafts
- To impart knowledge about the avionic architecture and various avionics data buses
- To gain more knowledge on various avionics subsystems

Couse Outcomes:

- Ability to build Digital avionics architecture
- Ability to Design Navigation system
- Ability to design and perform analysis on air system.
- Integrate avionics systems using data buses.
- Analyze the performance of various cockpit display technologies.
- Design autopilot for small aircrafts using MATLAB

Unit1: Introduction to Avionics (10 Hours)

Need for avionics in civil and military aircraft and space systems – integrated avionics and weapon systems – typical avionics subsystems, design, technologies – Introduction to digital computer and memories.

Unit 2: Digital Avionics Architecture (10 Hours)

Avionics system architecture – data buses – MIL-STD-1553B – ARINC – 420 – ARINC – 629.

Unit 3: Flight Decks and Cockpits (10 Hours)

Control and display technologies: CRT, LED, LCD, EL and plasma panel – Touch screen – Direct voice input (DVI) – Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS.

Unit 4: Introduction to Navigation Systems (10 Hours)

Radio navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA, ILS, MLS – Inertial Navigation Systems (INS) – Inertial sensors, INS block diagram – Satellite navigation systems – GPS.

Unit 5: Air Data Systems and Auto Pilot (10 Hours)

Air data quantities – Altitude, Air speed, Vertical speed, Mach Number, Total air temperature, Mach warning, Altitude warning – Auto pilot – Basic principles, Longitudinal and lateral auto pilot.

References:

- Pallet.E.H.J., "Aircraft Instruments and Integrated Systems", Pearsons, Indian edition 2011.
- Spitzer, C.R. "Digital Avionics Systems", Prentice-Hall, Englewood Cliffs, N.J.,U.S.A. 1993. Spitzer. C.R. "The Avionics Hand Book", CRC Press, 2000

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AEA-802 (B) Industrial Aerodynamics

AEA-802 (B)	**Industrial Aerodynamics**	**3L:0T:1P**	**3 credits**	**3Hrs/Week**

Course Preamble:

- To familiarize the learner with non-aeronautical uses of aerodynamics such as road vehicle, building aerodynamics and problems of flow induced vibrations

Couse Outcomes:

- Use of aerodynamics for non- aerodynamics such as vehicle, building.
- Solve the problems and able to analyses vibrations during flow
- Identify the Atmospheric boundary layer and applications of wind energy collectors.
- Analyze the aerodynamics of road vehicles, buildings and problems of flow induced vibrations.

Unit 1: Atmosphere (10 Hours)

Types of winds, Causes of variation of winds, Atmospheric boundary layer, Effect of terrain on gradient height, Structure of turbulent flows.

Unit 2 :Wind Energy Collectors (10 Hours)

Horizontal axis and vertical axis machines, Power coefficient, Betz coefficient by momentum theory.

Unit 3: Vehicle Aerodynamics (10 Hours)

Power requirements and drag coefficients of automobiles, Effects of cut back angle, Aerodynamics of trains and Hovercraft.

Unit 4: Building Aerodynamics (10 Hours)

Pressure distribution on low rise buildings, wind forces on buildings. Environmental winds in city blocks, Special problems of tall buildings, Building codes, Building ventilation and architectural aerodynamics.

Unit 5: Flow Induced Vibrations (10 Hours)

Effects of Reynolds number on wake formation of bluff shapes, Vortex induced vibrations, Galloping and stall flutter.

References:

- M.Sovran (Ed), “Aerodynamics and drag mechanisms of bluff bodies and Road vehicles”, Plenum press, New York, 1978.
- Sachs. P., “Winds forces in Engineering”, Pergamon Press, 1978.

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Open Core Elective-IV

AEA 803(A) Economic Policies in India

AEA 803(A)	**Economic Policies in India**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

- The students get clear perspectives about social sciences and the subject matter of Economics.
- The students gather fundamental knowledge and information about theoretical foundations social sciences especially Economics.

Course Outcomes

On successful completion of the course, the student will:

- To enable the students to understand the theories and strategies of growth and development.
- The student becomes able to analyze individual rationality in situations of scarcity and choice

Unit –I Basic features and problems of Indian Economy: - (10 Hrs)

Nature of Indian Economy, demographic features and Human Resource Development (HDI), Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

Unit-II Sectorial composition of Indian Economy (10 Hrs)

- Issues in Agriculture sector in India ,land reforms Green Revolution and agriculture policies of India , Industrial development , small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

Unit-III Economic Policies :- (10 Hrs)

Economic Planning in India , Planning commission v/s NITI Aayog, monetary policy in India, Fiscal Policy in India,

Unit IV Centre state Finance Relations, **(10Hrs)**

Finance commission in India. LPG policy in India.

Unit-V External sector in India: -(10Hrs)

India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

References:

- Dutt Rudder and K.P.M Sunderam (2001): Indian Economy, S Chand & Co. Ltd. New Delhi.
- Mishra S.K & V.K Puri (2001) "Indian Economy and –Its development experience", Himalaya Publishing House.
- KapilaUma: Indian Economy: Policies and Performances, Academic Foundation

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Undergraduate Degree Courses in Engineering & Technology

Bachelor of Engineering (Aeronautical Engineering)

AEA 803(B) Internet of Things

AEA 803(B)	**Internet of Things**	**3L:0T:0P**	**3 Credits**	**3Hrs/Week**

Course Preambles:

- To assess the vision and introduction of IoT.
- To Understand IoT Market perspective.
- To Implement Data and Knowledge Management and use of Devices in IoT Technology.
- To Understand State of the Art - IoT Architecture.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes:

On successful completion of the course, the student will:

- Understand the concepts of Internet of Things
- Analyze basic protocols in wireless sensor network
- Design IoT applications in different domain and be able to analyze their performance
- Implement basic IoT applications on embedded platform

Unit 1: Introduction to IoT - (10 Hrs)

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

Unit 2: IoT & M2M - (10 Hrs)

Machine to Machine, Difference between IoT and M2M, Software define Network

Unit 3 :Network & Communication (10 Hrs)

Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges

Unit 4 :Domain specific applications (6 Hrs)

Domain specific applications of IoT Home automation, Industry applications, Surveillance applications,

Unit 5: Other IoT applications (6 Hrs)

Developing IoTs Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python.

Reference:

- Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
- Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

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AEA 804 Projects Stage –II

AEA 804	**Projects Stage –II**	**0L:0T:16P**	**8 credits**	**16Hrs/Week**

Preambles:

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under project stage-I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department. The assignment to normally include:

- In depth study of the topic assigned in the light of the Report prepared;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Preparing an Action Plan for conducting the investigation, including team work;
- Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department.
- Final Seminar Presentation before a Departmental Committee.