

**DAYALBAGH EDUCATIONAL INSTITUTE  
FACULTY OF ENGINEERING  
B.TECH. (AGRICULTURAL ENGINEERING)**

**FIFTH SEMESTER**

<b>COURSE NUMBER</b>	<b>COURSE TITLE</b>	<b>Credits</b>	<b>End sem. Exam.</b>	<b>Theory/ Practical</b>
AEM501	FARM MACHINERY AND EQUIPMENT I	3.0	Y	T
AEM502	FARM MACHINERY AND EQUIPMENT I LAB	1.0	Y	P
AEM503	TRACTOR AND AUTOMOBILE ENGINES	3.0	Y	T
AEM504	STATIONARY AND AUTOMOTIVE ENGINES LAB	1.0	Y	P
AEM505	SOIL AND WATER CONSERVATION ENGINEERING	2.0	Y	T
AEM506	AGROECOLOGY AND FOOD SUSTAINABILITY	2.0	Y	T
EEM507	ELECTRICAL TECHNOLOGY	3.0	Y	T
EEM508	ELECTRICAL TECHNOLOGY LAB	1.0	Y	P
EGC581	DESIGN ENGG./ THEME DEVELOP. PROJECT	1.0	N	P
EGC582	PRACTICAL TRAINING	2.0	N	P
CRC581	COMPARATIVE STUDY OF RELIGIONS	2.0	N	T
<b>MAINSTREAM AGRICULTURAL ENGINEERING</b>				
AEM507	CROP PROCESS ENGINEERING	3.0	Y	T
AEM508	PHE LAB	1.0	Y	P
MAM582	PROBABILITY AND STATISTICS	3.0	Y	T
<b>DAIRY ENGINEERING SPECIALIZATION</b>				
AEM509	INTRODUCTION TO DAIRY FARMING	3.0	Y	T
AEM510	DAIRY FARMING LAB	1.0	Y	P
MAM582	PROBABILITY AND STATISTICS	3.0	Y	T
<b>AGRITECH &amp; ENTREPRENEURSHIP SPECIALIZATION</b>				
AEM511	IOT IN AGRICULTURE SYSTEMS	3.0	Y	T
AEM512	IOT LAB	1.0	Y	P
MAM582	PROBABILITY AND STATISTICS	3.0	Y	T
<b>TOTAL CREDITS</b>		<b>28.0</b>		

**Course Number: AEM501, Course Title: Farm Machinery and Equipment I**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 3, Periods (55 mts. each)/week: 3(L:3+T:1+P:0+S:0), Min.pds./sem: 52  
Unit1

Introduction to farm mechanization. Classification of farm machines. Unit operations in crop production. Identification and selection of machines for various operations on the farm. Hitching systems and controls of farm machinery. Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines.

Unit2

Introduction to seed-bed preparation and its classification. Familiarization with land reclamation and earth moving equipment. Introduction to machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage.

Unit3

Measurement of draft of tillage tools and calculations for power requirement for the tillage machines. Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, Identification of major functional components. Attachments with tillage machinery.

Unit4

Introduction to sowing, planting & transplanting equipment. Introduction to seed drills, no-till drills, and strip-till drills. Introduction to planters, bed-planters and other planting equipment. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation.

Unit5

Introduction to materials used in construction of farm machines. Heat treatment processes and their requirement in farm machines. Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application. Identification of heat treatment processes specially for the agricultural machinery components.

**Suggested Readings**

Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.

Smith HP and LH Wilkey. Farm Machinery and Equipment.

Culpin Claude. Farm Machinery.

Srivastava AC. Elements of Farm Machinery.

Lal Radhey and AC Datta. Agricultural Engineering.

**Course No: AEM502, Course Title: FARM MACHINERY AND EQUIPMENT I LAB**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 1, Periods (55 mts. each)/week: 2(L:0+T:0+P:2+S:0), Min.pds./sem:26

1. Familiarization with different farm implements and tools.
2. Study of hitching systems, Problems on machinery management.
3. Study of primary and secondary tillage machinery – construction, operation, adjustments
4. Primary and secondary tillage machinery - calculations of power and draft requirements.
5. Study of sowing and planting equipment – construction, types,
6. Calculation for calibration and adjustments of sowing and planting equipment.
7. Study of transplanters – paddy, vegetable, etc.
8. Identification of materials of construction in agricultural machinery and study of material properties.

Study of heat treatment processes subjected to critical components of agricultural machinery.

**Course Number: AEM503, Course Title: TRACTOR AND AUTOMOBILE ENGINES**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 3, Periods (55 mts. each)/week: 3(L:3+T:0+P:0+S:0), Min.pds./sem: 39

#### Unit1

Study of sources of farm power –conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. General energy equation and heat balance sheet. Study of mechanical, thermal and volumetric efficiencies.

#### Unit2

Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines. Study of Engine Valve systems, valve mechanism, Valve timing diagram, and valve clearance adjustment. Study of Cam profile, valve lift and valve opening area.

#### Unit3

Study of fuel supply system. Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines. Study of detonation and knocking in IC engines. Study of carburetion system, carburetors and their main functional components. Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles – their types and working principle.

#### Unit4

Engine governing – need of governors, governor types and governor characteristics. Study of lubrication system – need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves. Additives in the coolant. Study of radiator efficiency.

#### Unit5

Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners. Study of ignition system of SI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing.

#### Suggested Readings

Liljedahl J B and Others. Tractors and Their Power Units.  
Rodichev V and G Rodicheva. Tractors and Automobiles.  
Mathur ML and RP Sharma. A course in Internal Combustion Engines.  
Singh Kirpal. Automobile Engineering – Vol II.  
Heitner Joseph. Automotive Mechanics : Principles and Practicals

#### **Course No: AEM504, Course Title: STATIONARY AND AUTOMOTIVE ENGINES LAB**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 1, Periods (55 mts. each)/week: 2(L:0+T:0+P:2+S:0), Min.pds./sem:26

1. Introduction to different systems of CI engines; Engine parts and functions, working principles etc.
2. Valve system – study, construction and adjustments;
3. Oil & Fuel – determination of physical properties;
4. Air cleaning system;
5. Fuel supply system of SI engine; Diesel injection system & timing;
6. Cooling system, and fan performance, thermostat and radiator performance evaluation;
7. Part load efficiencies & governing;
8. Lubricating system & adjustments;
9. Starting and electrical system; Ignition system;
10. Tractor engine heat balance and engine performance curves;
11. Visit to engine manufacturer/ assembler/ spare parts agency.

#### **Course Number: AEM505, Course Title: SOIL AND WATER CONSERVATION ENGINEERING**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 2, Periods (55 mts. each)/week: 2(L:2+T:1+P:0+S:0), Min.pds./sem: 39

#### Unit1

Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion.

#### Unit2

Gullies - Classification, stages of development. Soil loss estimation – Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity - estimation by KE>25 and EI30 methods.

#### Unit3

Soil erodibility - topography, crop management and conservation practice factors. Measurement of soil erosion - Runoff plots, soil samplers. Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching.

#### Unit4

Engineering measures– Bunds and terraces. Bunds - contour and graded bunds - design and surplussing arrangements. Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour stonewall and trenching. Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains.

#### Unit5

Grassed waterways and design. Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and shelter belts and stabilization of sand dunes. Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks.

#### Suggested Readings

Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Mahnot S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service, New Delhi.

Mal B.C. 2014. Introduction to Soil and Water Conservation Engineering. 2014. Kalyani Publishers.

Michael A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.

MurthyV.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.

Norman Hudson. 1985. Soil Conservation. Cornell University Press, Ithaka, New York, USA.

Frevert R.K., G.O. Schwab, T.W. Edminster and K.K. Barnes. 2009. Soil and Water Conservation Engineering, 4th Edition, John Wiley and Sons, New York.

Suresh R. 2014. Soil and Water Conservation Engineering. Standard Publisher Distributors, New Delhi

### **Course Number: AEM506, Course Title: AGROECOLOGY AND FOOD SUSTAINABILITY**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 2, Periods (55 mts. each)/week: 2(L:2+T:1+P:0+S:0), Min.pds./sem: 39

#### UNIT1

Agroecology-Principles, Concepts, elements, Agroecological basis for conversion to organic management-crop rotation, soil health, crop diversity, indicators of sustainability, ecological processes in sustainable agriculture. Food security via optimization in demand-importance of zero waste concept.

#### UNIT2

Agro-ecosystems– Impact of climate change on Agriculture, Effect on crop yield, Effect on soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance – Natural farming principles – Sustainability in rainfed farming – organic farming – principles and practices.

#### UNIT3

Land resources of India, Population of land, Land utilization, Net area sown, Changes in cropping pattern, Land degradation. Rainfall forecasting – Adequacy of rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential, Watersheds and Utilizable surface water – Utilizable water in future (Ground water and surface water).

#### UNIT4

Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Rural Land Market – Emerging water market – Vertical farming – Sustainable food security

indicators and index – Indicators of sustainability of food security – Path to sustainable development.

#### UNIT5

Food and Crop production policies – Agricultural credit Policy – Crop insurance – Policies c Natural Resources Use – Policies for sustainable Livelihood – Virtual water and trade Sustainable food Security Action plan.

#### SUGGESTED READINGS:

B.K. Desai and Pujari, B.T. Sustainable Agriculture: A Vision for Future, New India Publishing Agency, New Delhi, 2007

Saroja Raman, Agricultural Sustainability – Principles, Processes and Prospects, CRC Press, 2013

### **Course Number: EEM507, Course Title: ELECTRICAL TECHNOLOGY**

Class: B.Tech., Status of Course: MAJOR COURSE, Approved since session: 2004-05

Total Credits: 3, Periods (55 mts. each)/week: 3(L:3+T:1+P:0+S:0), Min.pds./sem.: 39

#### UNIT 1

Armature reaction, methods to eliminate undesirable effects of armature reaction. Commutation, resistance commutation, reactance voltage. Starting of DC motor, three point and four point starters, Speed control of DC motor.

#### UNIT 2

Types, difference between distribution and power transformers. Three phase connections, Parallel operation, and concept of transformer harmonics. Brief idea about cooling methods.

#### UNIT 3

No load and blocked rotor test, starting methods, methods of speed control, crawling, Double cage induction motor, Applications.

#### UNIT 4

Single Phase Induction Motor, Shaded pole motor, Reluctance motor, Hysteresis motor operation and applications.

#### UNIT 5

Types, constructional details, emf equation, synchronous reactance, voltage regulation synchronous impedance method, Power angle characteristics. Power factor improvement. V-curve Applications.

#### SUGGESTED READING:

MG Say: ELECTRICAL MACHINERY

H Cotton: ELECTRICAL MACHINE

SK Pillai: ELECTRICAL DRIVES

### **Course Number: EEM508, Course Title: ELECTRICAL TECHNOLOGY LAB**

Class: B.Tech., Status of Course: MAJOR COURSE, Approved since session: 2000-01

Total Credits: 1, Periods (55 mts. each)/week: 2(L:0+T:0+P:2+S:0), Min.pds./sem.: 26

List of experiments:

1. To study the Magnetization or open circuit characteristics of separately excited D.C. generator and to trace the Hysteresis loop
2. the operation of a D.C. shunt motor starter and to find the variation in speed of a D.C. shunt motor by (I) Field control (ii) Armature resistance control
3. To study the drum controller and draw the Speed-Torque characteristics at different notches of drum controller of a D.C. Traction motor.
4. To find the efficiency of a single phase Transformer by open circuit and short circuit tests.
5. To find the efficiency of a D.C. motor by Indirect Method (Swinburn's Test)
6. To study the parallel operation of two single phase Transformer.
7. To perform no load and block rotor tests on three phase Induction motor and to determine efficiency.
8. To synchronize two three phase 230 volts, 50 Hz Alternator.
9. To determine the Regulation of Alternator by Synchronous Impedance Method.

### **Course Number: AEM507, Course Title: CROP PROCESSING ENGINEERING**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 3, Periods (55 mts. each)/week: 3(L:3+T:1+P:0+S:0), Min.pds./sem: 39

#### UNIT I

Scope and importance of food processing, post harvest losses, principles and methods of food processing. Processing of farm crops; cereals, pulses and oil seeds and their products for food and feed. Processing of animal products, minimal processing, Principle of size reduction, grain shape, size reduction machines; crushers, grinders, cutting machines etc. – operation, efficiency and power requirement – Rittinger's, Kick's and Bond's equation, fineness modulus.

#### UNIT II

Theory of mixing, types of mixtures for dry and paste materials, rate of mixing and power requirement, mixing index. Theory of separation, size and unsized separation, types of separators, size of screens, sieve analysis, capacity and effectiveness of screens, pneumatic separation.

#### UNIT III

Microwave and Dielectric heating. Extrusion processing, Scope & importance of material handling devices, study of different types of material handling systems; belt, chain and screw conveyor, bucket elevator, pneumatic conveying, gravity conveyor- design consideration, capacity and power requirement.

#### UNIT IV

Moisture content and methods for determination, importance of EMC and methods of its determination, EMC curve and EMC model, principle of drying, theory of diffusion, mechanism of drying- falling rate, constant rate, thin layer, deep bed and their analysis, critical moisture content, drying models, calculation of drying air temperature and air flow rate, air pressure within the grain bed, Shred's and Hukill's curve, different methods of drying including puff drying, foam mat drying, freeze drying, etc. Study of different types of dryers- performance, energy utilization pattern and efficiency, study of drying and dehydration of agricultural products.

#### UNIT V

Types and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidities inside storage, calculation of refrigeration load; modified atmospheric storage and control of its environment, air movement inside the storage, storage of grains: destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through different methods, warehouse - design and control of environment. Storage condition for various fruits and vegetables under cold and CA storage system. Economic, aspects of storage.

#### SUGGESTED READING:

Carl.W.Hall. (1980). Crop drying. AVI Publishing Co. Inc.

Chakravarty,A . (1995). Post Harvest technology of Cereals,Pulses and Oil Seeds. Oxford and IBH Pub.Co., Calcutta.

Earle,R.L. (1985). Unit Operations in Food Processing. Pergamon Press, Oxford.U.K.

Fellows,P . (1993). Food Processing technology, Principles and Practice. Ellis Horwood,USA.

Handerson,S.M and Perry,R.L. (1955). Agrl.Process Engg. John,Willey & Sons, New York. 6. Majumdar

#### **Course Number: AEM508, Course Title: PHE LAB**

Class: B.Tech., Status of Course: MAJOR COURSE, Approved since session:

Total Credits: 1, Periods (55 mts. each)/week: 2(L:0+T:0+P:2+S:0), Min.pds./sem.: 26

#### PHE LAB EXPERIMENTS

1. Performance evaluation of different types of cleaners and separators,
2. Determination of separation efficiency,
3. Study of different size reduction machines and performance evaluation,
4. Determination of fineness modulus and uniformity index, Study of different types of conveying and elevating equipments,
5. Study of different types of mixers.
6. Measurement of moisture content: dry basis and wet basis, Study on drying characteristics of grains and determination of drying constant, Determination of EMC (Static and dynamic method), Study of various types of dryers,

7. Study of different equipments in rice mills and their performance evaluation,
8. Study of different equipments in pulse mills and their performance evaluation,
9. Study of different equipments in oil mills and their performance evaluation,
10. Type of process flow charts with examples relating to processing of cereals pulses and oil seeds.

**Course No.: MAM582, Course Title: PROBABILITY AND STATISTICS**

Class: B.Tech., Status of Course: MAJOR COURSE, Approved since session: 2017-18

Total Credits: 3, Periods (55mts. each)/week: 3, Min pds./sem: 39

[Applicable from session 2018-19]

**UNIT 1**

Conditional Probability, Baye's Theorem; Measure of central Tendency and dispersion in terms of moments. Mathematical expectations.

**UNIT 2**

Random Variables: Discrete and continuous, Probability mass/ density function, cumulative mass/density function. Binomial, Poisson and Normal distributions and their applications.

**UNIT 3**

Sampling distribution, central limit theorem, Estimation; Point and interval estimation using z and t distribution.

**UNIT 4**

Two types of error, confidence and significance level (small and large samples). Testing of Hypothesis based on means proportions.  $\chi^2$  – test as the test of independence and goodness of fit.

Test based on variance; F-distribution; one way ANOVA.

**UNIT 5**

Curve fitting (Method of least square) correlation analysis. Linear regression analysis.

**SUGGESTED READING:**

Walpole, R.E., Mayers, R.L., Myers, S.L., and Ye K., 'Probability and Statistics for engineers and scientists', Pearson Education.

Johnson, R.A., Probability and statistics for Engineers, PHI.

Kapoor and Saxena, Mathematical Statistics, S. Chand.

**Course Number: AEM509, Course Title: INTRODUCTION TO DAIRY FARMING**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 3, Periods (55 mts. each)/week: 3(L:2+T:1+P:0+S:0), Min.pds./sem: 39

**UNIT 1**

Introduction to Animal Husbandry. Distinguishing characteristics of Indian and exotic breeds of dairy animals. Traditional Systems of cattle keeping, General dairy farm practices. Care of animals at calving and management of neonates.

**UNIT 2**

Health & Rearing- Digestive system of ruminants, Mammary system, Milk secretion and milk let down. Common disease problems in dairy animals, their prevention and control. Management of lactating animals. Methods of milking, milking procedure and practices for quality milk production. Systems of housing dairy animals. Basic concepts of Calf Rearing, Heifer Rearing, Care of Lactating cattle and Pregnant Cattle, Drying of cattle

**UNIT3**

Feed and Nutrition-Feed nutrients required by animal body. Feed resources for milk production and their nutritive values. Measures of feed energy. Nutrients requirements for growth and milk production. Feeding standards.

**UNIT 4**

Male and female reproductive system. Estrus to reproductive cycle. Ovulation, fertilization, gestation, parturition, pregnancy diagnosis. Systems of breeding and methods of selection of dairy animals. Strategy of cattle improvement; Artificial insemination and embryo transfer and their role in animal improvement. Introduction to biotechniques in dairy animal production.

## UNIT 5

Socio-economic and geographical features of Indian dairying., estimates of milk production, utilization and sale; cattle & buffalo population and its distribution; trends in population growth, annual milk production and per capita availability; productivity profile of indigenous dairy stock, industrial by-products of livestock industry. Dairy development; major aided dairy projects; public sector milk supply schemes; co-operative dairy organizations, import substitutions in dairy products. key village scheme and its limitations, intensive cattle development programme concept, approach and achievements. Public sector dairy schemes, National Dairy Development Board, Operation Flood I, II, III, improvements of dairy co-operative organization, Dairy development Corporations, Cooperative Dairy Federations

### RECOMMENDED READINGS

V.M Rao Dairy Farming H.Singh Dairy Farming Eckles, C.H. Dairy Cattle and Milk Production ICAR Hand book of Animal Husbandry

### **Course No: AEM510, Course Title: DAIRY FARMING LAB**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 1, Periods (55 mts. each)/week: 2(L:0+T:0+P:2+S:0), Min.pds./sem:26

1. To identify appropriate dairy cattle breeds to a specified locality with which the learner is familiar. Justify the selection with regard to climatic condition, locality and market requirements
2. To familiarize with the lactation cycle of a cow. List out the farm husbandry factors and diet plan of cow influence the lactation cycle. Identify the management tasks carried out over a period of 1 month to control the lactation cycle in dairy cattle
3. Identify the pests, diseases and irregularities significant in the locality familiar to the learner. Develop the checklist for the signs of ill health, which should be routinely checked in dairy cattle.
4. Calculate the rations for a dairy cattle according to specified characteristics, such as weight, milk produced and butterfat concentration. List out the nutritional requirement of a typical dairy cattle.
5. To familiarize with the milking systems, storage of milk, quality control of cow and milk and cleaning systems at a dairy farm. Prepare a flow chart of the visited dairy farm operations
6. To familiarize with quality control tests of raw milk. Prepare the record of collected samples with observations.
7. To familiarize with the production of common dairy products, such as pasteurized milk, yogurt, whey drinks, butter, cheese etc. Prepare the flow chart of production processes
8. To familiarize with the marketing plan and quality management systems at the dairy plant.
9. Explain the waste management practices at the visited dairy plant. Identify the loop holes and prepare a plan accordingly.

### **Course Number: AEM511, Course Title: IOT IN AGRICULTURE SYSTEMS**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 3, Periods (55 mts. each)/week: 3(L:3+T:1+P:0+S:0), Min.pds./sem: 39

#### Unit 1

An overview of IOT in Agriculture, potential and challenges, Application of IOT in Agriculture, Architecture and component of a typical IOT system

#### Unit 2

Feeling Things: Typical sensors and sensor nodes used in Agriculture such as weather, soil, air and crop, Tag Things:Technology available to tag things such as bar code, QR code,RFID

#### Unit 3

Acting Things: Typical actuators in Ag applications

Thinking Things:Embedded and single chip controllers, Setting up a sever for IOT system



#### Unit 4

MS Farm Beat sensors and microcontrollers, Edge computing for IOT based system-performance and security considerations, IOT in field management (input side)-water management, nutrient management etc.

#### Unit 5

IOT in field management (output side)-crop harvesting, IOT in livestock management, IOT in smart field equipment, study on working principle of atleast four sensors as a part of IOT.

#### Suggested Readings

Erik Brynjolfsson and Andrew McAfee. The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies.

Cuno Pfister. Getting started with Internet of Things

Sudha Jamthe. IoT : Disruptions: The Internet of Things - Innovations and Jobs.

Peter Lucas and Joe Balley. Trillions.

Arshdeep Bahga and Vijay Madisetti. Internet of Things : A hands on Approach

Pattnaik, Prasant Kumar, Kumar, Raghvendra, Pal, Souvik. Internet of Things and Analytics for Agriculture. Volume2.

#### **Course No: AEM512, Course Title: IOT LAB**

Class: B.Tech., Status of Course: Major Course, Approved since session:

Total Credits: 1, Periods (55 mts. each)/week: 2(L:0+T:0+P:2+S:0), Min.pds./sem:26

#### Part 1: Basic Programming (Existing)

Experiments on Control Structures, Arrays, Linked Lists Structures, Files and Pointers

Part 2: Sensor based programming using Arduino, Experiments on, Blinking an LED, Reading a Potentiometer, Driving an RGB LED and Multiple LEDs, Push Buttons, Reading a Photo resistor,

Obstacle Sensor, Gas Sensor, Fire Sensor, Relay Sensor, Heart Beat Sensor and related real world experiments.

#### **Course Number: EGC581, Course Title: DESIGN ENGG./THEME DEVELOP. PROJECT**

Class: B.Tech., Status of Course: Core Course, Approved since session: 2007-08

Total Credits: 1.0, Periods (55 mts. each)/week: 2 (L:0+T:0+P:3+S:0), Min.pds./sem: 39

The students submit projects connected to Design Engineering Concept and Theme development of real life industrial problems. The evaluation in the following topics will constitute 40% of the total marks in EGC581:

1. Design methods, Design process, Identification of need, Design concepts, Design decisions and Development of design.
2. Economics in Engineering Design, Optimization and reliability.

#### **Course Number: EGC582, Course Title: PRACTICAL TRAINING (SURVEY CAMP)**

Class: B.Tech., Status of Course: Core Course, Approved since session: 2015-16

Total Credits: 2

The students are expected to undergo practical training in different industries allotted to them at different places, in order to acquaint themselves. The various shop floor activities, industrial environment, problems faced in industries. They are required to submit a report on the training and the evaluation through internal and external viva voce.

#### **Course Number: CRC581**

#### **Course Title: COMPARATIVE STUDY OF RELIGION**

Status of Course: CORE COURSE, Approved since session: 2014-15

Total Credits: 2, Periods (55mts. each)/week: 2 (L-2+T-0+P/S-0), Min.pds./sem: 26

UNIT 1: (a) Meaning of the word 'Dharam' and 'Religion'. (b) History of Religion-Scientific Perspective. (c) Religion, Ethics and Values.

UNIT 2: (a) Pre-Vedic Religion. (b) Concept of Vedic Dieties and Relevance of Yajna. (c) Philosophy of Upanishad. (d) Bhagwadgita in perspective of scientific age. (e) Hinduism-Shaiva, Vaishnav and Shakta (Modern Trends).

UNIT 3: (a) Bhartiya Darshan (Yoga). (b) Jainism-(Modern Trends and Scientific Perspectives). (c) Buddhism-(Modern Trends and Scientific Perspectives).

UNIT 4: (a) Zoroastrianism (b) Judaism (c) Christianity-(Modern Trends and Scientific Perspectives). (d) Islam and Sufism-(Modern Trends and Scientific Perspectives).

UNIT 5: (a) Meaning of the word 'Sant' and Contribution of Sant Kabir and Guru Nanak and Tulsi Sahab in Saint tradition. (b) Radhasoami Faith and its Scientific Relevance. (c) (i) Religion and Modern Scientific age. (ii) Religion and future of Mankind.

SUGGESTED READINGS:

LM Joshi & Harbans Singh: AN INTRODUCTION TO INDIAN RELIGIONS

BS Mishra: DISCOURSES ON RADHASOAMI FAITH

Bhagwandas: ESSENTIAL UNITY OF ALL RELIGION

Bhagwandas: SAB DHARAMON KI BUNIADI EKTA

Parashuram Chaturvedi: UTTARI BHARAT KI SANT PARAMPARA

Prabha Sharma: DHARAM-SWAROOP EVAM SANDHARBH

Dayalbagh Educational Institute (DEI): VISHWA KE VIVIDH DHARAM

Ravindranath Tagore: RELIGION OF MAN

GR Singh: & CW Devis: VISHWA KE PRAMUKH DHARAM

KN Tiwari: COMPARATIVE RELIGION

VP Singh: DHARAM EVAM SANSKRITI