

Detail Syllabus for I year B. Tech – Agricultural Information Technology (II Semester)

AAU 201

BASIC ELECTRONICS AND INSTRUMENTATION TECHNOLOGY

(2+1)

Unit I Basics of Electricity

Electrical quantity – voltage, current, power, energy, resistance, inductance and capacitance. Circuit elements – ohms law, Kirchoff's current and voltage law. Resistors in series and parallel – Alternating current –basic definitions - power and power factor. Measurement of energy – Electrical machines – types of motors – DC motor and AC motor – Applications.

Unit II Electronics

Passive electronic components, resistors – fixed, variable – color coding – capacitors variable and fixed – types & specification – inductors and chokes. Active electronic components: P.N. junctions – semiconductor diodes – characteristics – application – rectifiers. Transistor – working of PNP transistor – common emitter configuration – applications – amplification. Photo electric devices – photo transistor – working – photocell – light emitting diode (LED). Integrated circuits – advantages and limitations – classifications – linear and digital – examples. Operational amplifiers – Logic gates.

Unit III: Basics of instruments

Transducers – classifications of transducers – requirements and principles. Displacement – LVDT, capacitive transducers – temperature – RTD and thermocouple.

Unit IV: Instrument technology for agriculture

Instrument for measurement of pH, Electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil temperature.

Unit V: Applications of Electronics in Agriculture

Instrument for crop monitoring – moisture measurement – capacitive, infrared reflectance and resistance. Monitoring soil and weather – measurement of soil properties and meteorological parameters – irrigation control systems. Instruments for crop establishment monitoring. Crop spraying – selective crop spraying – flow control. Yield monitoring. Technology for precision farming. Instruments for protected cultivation – green house environment control – transducers and control system. Instruments and systems for crop handling processing and storage.

DEMO OF

- Study of multi meter and its use
- Study of voltmeter, ammeter and energy meter and its use.
- Identification of resistors, capacitors and other components.
- Study of colorimeter its principles and usage.
- Study of spectrophotometer, its principle operation, maintenance and troubleshooting.
- Study of principle of chlorophyll meter its use and maintenance
- Study of principle of leaf area meter – its use and maintenance
- Study of instrument for measurement of seed moisture

- Experiments on soil moisture measurement
- Study of Gas chromatograph, its operation and maintenance
- Study of principles of operation of PH meter and its operation, maintenance and trouble shooting
- Study of principles of operation of E.C. meter and its operation
- Study of instruments used in meteorology
- Visit to green house with environmental control.
- Visit to Agro processing facility with electronic sorters, graders, counters

AIT 201

DESIGN AND ANALYSIS OF ALGORITHMS AND DATA STRUCTURES

(2+1)

UNIT I Concepts of Algorithms

Introduction to Algorithms – Algorithm Development – Complexity analysis – Recursion classes – String Algorithms – Concepts of Pseudo code.

UNIT II Linear Data structures

Introduction to Linear Data structures: Pointers, relationships in C between pointers and arrays.

Queues and stacks. Application to storage allocation, de-allocation and garbage

UNIT III Linked lists

Introduction to linked lists- Singly, doubly and circularly linked lists; algorithms for creation, insertion, deletion and search.

UNIT IV Trees and graphs

Introduction to graphs representation – Traversal-Depth first search, Breadth first search - Adjacency matrix and list representation –Tree-Shortest path, minimum spanning tree –Tree- all pairs Shortest Path, Transitive Closer, Splay Trees –Binary Trees - Representation – operations: insert, delete – Traversal – preorder, inorder, postorder. N-ary trees: Definitions, balanced treed, definitions of B-tree, insertion, deletion and search algorithm of B-trees; B-tree based keyed access to records in a file.

UNIT V Sorting

Analysis of simple sorting techniques such as shell sort, bubble sort, insertion sort, selection sort, quick sort, heap sort and merge sort. Sorting based on binary and n-ary trees.

UNIT VI Searching

Concepts, programming and operations of simple search & binary search – Concepts, programming and applications of AVL – trees, B – tree search – Concepts, programming and applications of hashing technique – Concepts, programming and applications of pattern matching

PRACTICAL

- Description of the algorithm in English, pseudo code development and diagrammatic explanation
- Pseudo code, diagrams, simulations for
 - Arrays, strings, stacks, queues, Linked lists
 - Pseudo code, diagrams, simulations for
 - Binary Searching, B-Tree, Spanning Tree

- Pseudo code & programming for
 - Shell sort, bubble sort, Insertion Sort, Merge Sort, Quick Sort
- Pseudo code & Programming : Spreadsheet application
- Pseudo code & Programming : Editor application

AGR 201

PRINCIPLES OF GENETICS

(2+1)

Unit I

Genetics, theories – definitions of genetic terms, Mendel's work, laws – dominance, epistasis, modifications in Mendelian ratio, different type of epistasis.

Unit II

Multiple alleles – blood groups – theories – pseudo alleles – examples – multiple gene inheritance – transgressive variation – linkage – coupling and repulsion.

Unit III

Crossing over – theories, two point, three point test cross, interference, coincidence, genetic map, sex determination – theories, sex linked inheritance, non disjunction, cytoplasmic inheritance – Chromosomal aberration – structural and numerical.

Unit IV

Pedigree analysis twins, quantitative genetics, DNA as genetic material, structure of DNA, protein synthesis, genetic code, operon model.

Unit V

Fine structure of the gene – PCR – plant genome structure – genomic data base – EST – identification of genes from sequenced data, computer applications in genetics, advantages and limitations.

PRACTICAL

- Study of genetic ratio – monohybrid – incomplete dominance and test cross ratio and in combination of one or two above
- Dihybrid ratio – dominance, incomplete dominance, and test cross ratio and in combination of one or two above
- Simple interaction of genes – comb character in fowls, dominant epistasis, recessive epistasis and duplicate recessive epistasis
- Duplicate and additive epistasis, duplicate dominant epistasis and dominant and recessive epistasis
- Problems in multiple alleles
- Problems in multiple factor inheritance
- Estimation of linkage with F2 and test cross data, coupling and repulsion
- Problems on two point test cross, three point test cross
- Working out interference, coincidence and drawing genetic maps
- Problems in gene action – interpretation of results – computer application
- Problems in working out – heritability and genetic advance – interpretation of results

UNIT I Computer organization and concepts

Introduction to computer systems – Number system –Representation of Information – Arithmetic operation – Boolean algebra - minimization of Boolean function using Karnaugh Map– Logical operation – AND, NOT, OR, XOR – Hardware and software implementation – Concepts of machine level, Assembly level and High level programming

UNIT II Microprocessor Fundamentals

CPU design - Arithmetic and Logic Unit and memory Unit – Addressing modes - Instruction set – Instruction interpretation – execution – Micro operation-arithmetic, logic and shift – Micro programmed control - Hardwired control CPU design – Concepts of semiconductor memory – CPU - memory interaction - organization of memory modules – Cache memory - mapping and replacement policies – Virtual memory

Unit III Input - output and storage

Introduction to input/output processing – VDU – keyboard control – Programmed controlled I/O transfer – Interrupt controlled I/O transfer – DMA Controller – Types of storage devices – secondary storage – Common Bus system - connecting I/O devices to CPU and memory

UNIT IV Microprocessor architecture

RISC and CISC paradigm – RISC and CISC characteristics – Design issues of a RISC processor – RISC /CISC processor examples – pipelining - pipeline hazard – pipeline architecture - design issues – Instruction level parallelism - advanced issues – Interconnection network.

UNIT V Multiprocessor architecture

Multiprocessors – characteristics – Memory organization for multiprocessors systems – Synchronization – models of memory consistency – Deadlock and scheduling – Cache in multiprocessor systems – problems – Cache coherence protocols – Parallel processing concepts – Parallelism algorithms

Demo for

- Microprocessor Trainer - Hardware
- Software based simulations – VHDL
- Hands-on PC disassembling/ assembling

Unit – I

Soil – types –Soil texture – structure-characteristics for suitability of crops – soil fertility and productivity- Agronomical measures to maintain fertility and productivity, soil organic matter in crop production – Tillage and tilling – objectives, principles and kinds of tillage and implements – effect of tillage – modern concept of tillage-zero tillage – problem soils and their management – management of wasteland –waterlogged and watershed.

Unit – II

Manure and fertilizers – soil fertility management – composting techniques – INM – green and green leaf manures– irrigation techniques – Micro Irrigation WUE, IWCPE ratio– Water requirement – less water crop production technologies – concept of advanced irrigation methods – water management devices – fertigation.

Unit – III

Crop production technologies : season –varieties- seed rate – sowing- geometry- manures weeds – methods of weed management –IWM and fertilizers- critical stages for input requirement – nutrient, irrigation – weed management and aftercare of major field crops : rice, major and minor millets, redgram, blackgram, greengram, groundnut, sesame, soybean, castor, sunflower, cotton, sugarcane.

Unit – IV

Production technologies for Biofuel crops – sweet sorghum, sugarbeet and jatropha – forage and fodder crops – preservation techniques – Hay silage making

Unit – V

Crop production in dry farming - agro techniques for drylands - soil erosion and conservation – sustainable agriculture – LEISA concepts - organic farming - bio pesticides and botanicals, IFS Concept.

PRACTICAL

Identification of soil problems - Identification of crops, and seeds and practicing different methods of seed bed preparation - Identification of manures and fertilizers, green manures and green leaf manures - Working out fertilizer requirement /unit cost and practicing fertilizer application methods - Composting techniques of farm wastes - Identification of tools and implements used in field crops - Working out seed rate and spacing for different field crops - Practicing different methods of seed treatment and sowing methods - Practicing thinning, gap filling, and earthing up - Observation of different methods of irrigation and visit to irrigation cafeteria - Identification of weeds and practicing different weed control methods - Practices and acquiring skill on use of biopesticide and botanicals for pest control - Biometric observation and growth and yield assessment of field crops - Forage crops – cultivation methods - Estimation of cost of cultivation and working out economics - Practical examination.

AGR 203

COMMERCIAL HORTICULTURE

(2+1)

Unit I Basic principles of Horticulture and propagation techniques

Horticultural zones of India - classification - Soil and climatic factors - methods of propagation - sexual and vegetative propagation - cutting, layering, grafting and budding – Micro propagation techniques - Principles, planning and layout of orchards.

Unit II Production methods and cropping systems

Study of planting systems - Bearing habits of fruit crops- Principles and methods of training and pruning - Cropping systems, inter cropping, multi tier cropping - Irrigation and fertigation systems - After cultural practices for annual and perennial horticultural crops.

Unit III Cultural hints and Protected cultivation for horticultural crops

Cultural hints for mango, banana, and grapes - tomato, potato, bittergourd, onion and bhendi - coriander, turmeric, pepper, coconut, tea and coffee - jasmine, rose, chrysanthemum, marigold - coleus, gloriosa, senna, geranium and lemon grass.

Protected Cultivation - basic concepts -Protected cultivation techniques for tomato, capsicum - rose, gerbera

Unit IV Preharvest, harvest and post harvest management

Maturity indices - Harvesting, grading and sorting, storage and marketing of fruits and vegetables - flowers, spices and plantation crops -Principles of post harvest handling of major fruit and vegetable crops - Flower crops - spices and plantation crops -Processing for horticultural products

Unit V Floral art, landscape gardening and turf management

Flower arrangements, floral products, bonsai making - Dry flower techniques Principles and elements of landscape gardening - Turfing and turf management.

PRACTICAL

Identification of different horticultural crops – Asexual propagation – grafting, budding, layering, cutting – Sexual propagation – seed sowing, seed treatment, transplants production – Practices in planning and layout of an orchard and different systems of planting – Preparation of fertilizer mixtures, field application techniques – preparation and application of growth regulators – Weed management techniques – Irrigation systems and practices – Practices in training and pruning – Hybrid seed production for vegetable crops – green houses – design, classification and components – Harvesting handling and packaging techniques – Practices in micro propagation techniques – Study of garden components and lawn making – Visit to commercial tissue culture laboratory – Visit to green house and poly house units – Visit to commercial orchards / plantations – Visit to fruit, flower and vegetable markets.

AIT 203

PROBABILITY AND INFORMATION SYSTEMS

(2+1)

Unit I: Information System Concepts

Role of Information Systems – Classification of Information systems – Transforming Data into Information – Producing Agribusiness Information – Elements of Information system – Concepts of Information systems

Unit II: Information Systems Technologies

Information system hardware technologies – Information system software issues – Theory of Computer Networks – Network Topologies – Telecommunication systems and services – Database systems architecture

Unit III: Information Systems Applications

Business support systems design and applications – Decision support systems implementation – Data mining and OLAP – e-Commerce systems design – Information system Security – Information security in organizations – Information security and social issues – Information System Audit

Unit IV: Information Systems Management

IS Planning and Acquisition – IS Project Management – Systems Development Life Cycle (SDLC) –Development of Structured Methodologies – Using Information Systems – Ergonomics and IS Design – Data Processing controls and Disaster Recovery

Unit V: Probability and Information Theory

Concept of randomness, random event and probability – Probability of single random events – Probability of multiple random events – Probability distribution functions – Specified probability distribution function (PDF) fitting random numbers – System Reliability - probability of failure – Redundancies or multiple pathways

PRACTICAL

Flowcharting Practice – Agricultural Information Systems – Library Information system Laboratory Information Management system – LIMS – MIS - Business Management system - case study – Hospital Information system - case study – Banking information system- Electronic fund transfer case study – DSS - Pest and Diseases management system – DSS - Greenhouse Management system - DSS- Weather based crop advisory – DSS - Garden Plants Information system – Farm Machinery / Implements Information system – DSSIFER - case study - ERP - Enterprise Resource planning - case study – Random number generation – Estimation of mean time between failures (MTBF)

AIT 204

SOFTWARE ENGINEERING

(2+0)

UNIT I

Software engineering definition; Software Development: Phases, Process models, Project structure, Project team structure, Role of metrics, Measurement, Software quality factors.

UNIT II

Planning and Software Project: Requirement analysis, Cost estimation, Project Scheduling, Quality Assurance Plan, and Project Monitoring Plans, Gantt charts, PERT and CPM.

UNIT III

System Design: Design Objectives, Design Principles, Design Tools and Techniques, Prototyping.

UNIT IV

Structured Programming Coding: Programming practices, Verification, Monitoring and Control.

UNIT V

Testing: Testing Fundamentals, Functional Testing, Structural Testing, Test Plan activities, Unit testing, Integration Testing.

UNIT VI

Reliability: Concept of Software Reliability, Reliability Models, Limitations of Reliability Models, Software Maintenance. CASE tools.