COURSE CAPSULES

First Semester

AE 5101. Water for Agriculture (2)
Soil-water-plant relations, Soil moisture availability, Water movement through soil, Plant and atmospheric systems, Impact of water stress on crop yield, Consumptive use, Determinations of crop water requirements, Estimation of field irrigation requirements, Irrigation scheduling, Determination of water requirements for field, Minor and major irrigation projects, Paddy vs. other field crops, Determination of water requirements under rainfed conditions.

AE 5102. Thermodynamics (2)
Fundamental concepts, Work and heat, Laws of thermodynamics and their applications, Properties and relationships, Cycles, Mixtures and psychometrics.

AE 5103. Hydrology and Meteorology (3)
Atmospheric physics, Formation and classification of clouds, Formations of disturbances, Depressions and cyclones, Rainfall governing mechanisms of Sri Lanka, Global weather events and their impact on rainfall of Sri Lanka. Hydrology cycle , Identification and quantification and analysis of hydrological processes, Ground water, Stream flow measurement, Hydrograph analysis, Runoff prediction, Reservoir and flood routing, Introduction to computer modeling.

AE 5104. Engineering Drawing (2)
Introduction to engineering drawing and projection systems, Lines and planes, Sections of solids, and interpenetration, Tolerance, Limits and fits, Line conventions and dimensioning of drawings, AUTOCAD and drawing projects.

AE 5105. Water and Society (2)
Importance of societal issues in relation to IWRM, Irrigation civilization and its origin; decline and resurgence of irrigation, Agrarian system and livelihood in Sri Lanka from early beginning to the present, Historical perspective of livestock production and fisheries, Communication skills for improved management systems, Community/Social/Capacity mobilization, Participatory approach in management systems for water and sanitation, Social theory and IWRM, Water rights, Water law and water as human rights, Decentralization, participation, privatization and regulatory authorities.

AE 5106. Physical Properties of Agricultural Products (2)
Introduction to physical characteristics of food and agricultural products, Volume and density measurements, Separation methods, aero- hydrodynamics, moisture isotherms, Centrifugation, Thermal Properties, Rheological Properties, Optical Properties, dielectric properties, Structural and textural characteristics.

AE 5107. Water Quality for Agriculture and Environment (2)
Introduction to water quality, water quality parameters, surface and groundwater pollution due to domestic, agricultural and industrial activities, impacts of water pollution, contaminant transport in soil and water system, water quality monitoring, pollution modelling, pollution control, water quality issues in Sri Lanka (Case studies).

AE 5108. Groundwater Development (2)
Occurrence of groundwater: aquifers, aquifer characteristics, Groundwater movement: determination of hydraulic conductivity (in-situ), Groundwater flow, Groundwater and well hydraulics: steady and unsteady unidirectional and radial flow into well, Multiple well systems, Surface investigation of groundwater: geologic

method, Electro resistivity method, Seismic refraction method, Well construction: testing wells for yield, pumping equipment, Groundwater levels and Environmental influences, Quality of groundwater and Pollution.

AE 5109. Soil Mechanics (2)
Definitions/Mass volume relationships, Particle size distribution/Engineering classification of soils, Compression and Compaction, Settlement and Consolidation, Capillarity and Permeability, Unsaturated water flow/steady state flow, Flow nets and Seepage, Effective stress and pore pressure, Soil strength, Stress, strain and failure criteria, Earth pressure and slope stability, Bearing capacity and shallow foundations, Ground investigation and ground improvement techniques.

AE 5110. Watershed Management (2)
Concepts and definitions of watershed management, Current problems in watersheds. Processes operating in a watershed. Quantification of hydrological and soil erosion processes. Impacts of land management on quantity and quality of water resources. Strategies to prevent watershed degradation. Formulation of watershed management projects. Methodologies for cost/benefit assessments. Integration of participatory approaches to watershed management. Case studies.

AE 5111. Engineering Mechanics (2)
Stress-strain relationships, Elastic constants, Direct stresses, Combined stresses due to bending, Deflection of beams, Torsion in circular shafts, Fluid static, Steady, Unsteady, uniform and Non-uniform flows, Laminar and turbulent flows, Bernoulli's equation and its application, Momentum equation and its application, Flow in pipes, Kinematics and dynamics of a particle, Plane kinematics of a rigid body, Velocity and acceleration diagrams (application of vectors) of simple mechanisms, Belt drive, Vibration of a single degree of freedom systems.

AE 5112. Farm Mechanization (2)
Introduction to mechanization and farm machinery, Measuring field performance and introduction to crop production equipment. Costing of farm machinery, Selection of optimum power requirements; Human factors and safety on operations.

AE 5113. Principles of Farm Machinery (2)
Research and development of farm machinery, Agricultural tractor, Mechanical and hydraulic power transmission. Soil tillage and traction. Tillage implements. Tractor stability. Design of field equipment.

AE 5114. Agricultural Structures and Environment (2)
Functional planning and principles of environmental control, cost estimation, structural component analysis and properties of building materials. Design of storage structures.

AE 5115. Electronics and Instrumentation in Agriculture (2)
Basic concepts and terminology. Electrical circuit analysis, bridge circuits. Semiconductor components; Diodes, Transistors, Thyristors. Basic electronics; Rectification and power supplies, OPAMPS and their uses, Logic circuits, Number systems, counters. Instrumentation;

sensors and transducers for measurement of pressure, temperature, force etc. Introduction to control systems. Computer interfacing; introduction to computer hardware, A/D and D/A conversion, Data acquisition and storage, automatic control.

AE 5116. Farm Machinery Testing and Evaluation (1)
Introduction to testing and evaluation of tillage machinery, Testing and evaluation of walking type tractors, Testing and evaluation of reapers and threshers, Ergonomic appraisal and safety testing, Testing and evaluation of four wheel tractor, PTO, Draw bar, Testing and evaluation of four wheel tractor, ROPS, Hydraulic handing, Testing and evaluation of water pumps and sprayers, Instrumentation for power measurements.

AE 5117. Numerical Analysis in Agricultural Engineering Applications (2)

Introduction to computer based analysis software, Special features in MS excel, Solution of equations by iteration, Solving sets of equations, interpolating polynomials, Curve fitting and approximation of functions, Numerical differentiation and numerical integration, Numerical solution of ordinary differential equations, Boundary value problems and characteristic value problems, Numerical solution of partial differential equations, Hyperbolic partial differential equations.

AE 5118. Principles of Post-harvest Biology and Technology (2)
Cereal grains and other durable commodities: Cereals; Structure, composition and functional constituents of commercially important grains. Pulses: classification and physical properties. The spices and nuts: a brief overview on post harvest techniques. Grain harvesting, threshing, drying and storage, milling processes and quality control especially paddy, rice and seed paddy. Perishables and semi-perishables: Post harvest sites of losses and principles of post harvest physiology, handling stress management, Design principles of temperature and humidity management systems. Post harvest handling of commercially important tropical fruits and vegetables. Quality control, cost benefit analysis and appropriate technology for post harvest systems. Field visits to post harvest handling and processing centres.

AE 5119. Water and Industry (2)
Water use in industry: Quantity & Quality of water in different types of industries- agro based, textile, garments, leather, chemical, organic fiber, mineral and manufacturing, Impact of industrial use of water on resources, pollution levels - quality of water, Abutment measures and technology for water use: Minimize reduction and reuse, effluent treatment systems, Interaction of enterprises in managing water and sanitary systems.

AE 5151. River Basin Planning and Management (2)
History of river basin management, Natural river basins and transfer systems, Land and water interactions, Planning systems, Assessment of water requirements for agriculture, domestic industrial and environmental sectors, Supply and demand management, Runoff modifications in developed river basins, Dams and alternatives, Impact of dams on eco-systems, Importance of wetlands and environmental releases, Climate change and river basin management, River basin institutions, conflict management Case studies in river basin planning an management.

AE 5152. Environmental Impact Assessment (2)
Need for EIA, Definitions, EIA process, Methods in EIA, Multidisciplinary approach to EIA, Assessment of impacts, implementations, EIA legislation, policy & institutions, Case studies.

AE 5153. Principles of Ergonomics in Agriculture (2)
Introduction to human factors engineering, Human factors and work efficiency, Biomechanics and materials handling techniques; lifting, carrying, other handling operations and packaging ergonomics. Ergonomics for safe work, Organization of work, design of work places and applied ergonomics for office and the use of ergonomic check list for evaluation of work places.

AE 5154. Applications of Remote Sensing in Agriculture (2)
Introduction to remote sensing, Basic principles of electromagnetic energy, Types of sensors, Data sources and platforms, Visual interpretation, Software for image processing, Digital image processing including radiometric and geometric corrections, Enhancement, Classification. Accuracy assessment, Applications in agriculture and related disciplines, Case studies.

AE 5155. Financing Water Development (2)
Economic value of water and cost reflective pricing, Commercial, fixed asset accounting. Analysis of financial statements, Tariff principles, increasing block tariffs and lifeline tariffs, Average historical cost accounting and long run marginal costing, Demand responsiveness: Ability to pay and willingness to pay. Pricing and service differentiation for the poor. Sources of finance for a long-term asset based industry, Decision-making for financial management: The Waterman Simulation.

AE 5156. Environment and Industry (3)
Location theory of industrial development. Impact of industry on environment. Inter Relationship between industry, environment, resource base and agriculture. Rural industrial development and alternative land use. Industrial waste disposal. Energy used in industry and environment considerations. Scale of operations, Infra structure development and impact on environment. Transport and disposal of hazardous wastes. Regulation - local and international relating to industrial development and environment. Environmental carrying capacity for industries. Greenhouse effects.

AE 5157. Solid Waste Management (2)
Classification of wastes, Agricultural, Industrial, Domestic, Municipal and Hazardous, Available methods of waste management, Design of Landfills, liner material, leachate formation and seepage, gas generation and migration, Landfill management and final closer, Design of aerobic and anaerobic digesters, Combines systems with constructed wetland, Incinerators: Design and operation open and close looped systems, Hazardous waste management, Secure landfills, incinerators and management of clinical wastes, Application of Cleaner Production (CP) and Green Productivity Concepts.

AE 5158. Organic Produce Certification and Marketing (1)
Organic produce concepts and problems, controlling organizations and certifiers, IFOAM. Consumer attitudes, market trends and packaging requirements. Standards and procedures in certification: growers, packers and shippers. Standards and procedures in certification. Marketing procedures. Canceling and renewing licenses and charges made for inspection.

AE 5159. Grading Packaging and Transportation of Fruits and Vegetables (2)
Introduction to primary processing of perishables for fresh market protection required by fresh fruit and vegetables, pack house operations and ergonomics of packing, International quality standard and commercial requirements, Transportation environment, Types of packaging and package design, Testing and evaluation of transport packages, packing patterns and analysis of packing forces in containers.

AE 5160. Advanced Power and Machinery (2)
Analysis of agricultural machine components and systems. Emphasis on hydraulic power transmission, Controls and management of machinery systems.

AE 5161. Solar Energy Applications in Agriculture (2)
Solar energy and available solar radiation, Heat transfer applied in solar energy, Theory of flat plate collectors, Concentrating collectors, System thermal calculations and experiments, Solar heating, Solar process economics, Design of solar systems, Solar industrial process heat, Conversion to mechanical energy, Evaporative processes and salt gradient ponds, project.

AE 5162. Tillage Engineering (2)
Analysis of stresses and strains in soils due to machine applied loads, Optimum soil conditions for tillage and relevant soil properties, Mechanics of interaction between agricultural soils and tillage equipment and traction devices, Tillage equipment.

AE 5163. Analysis of Agricultural Systems (2)
Identification and definition of systems, Systems Approach and its importance, Dynamic system modeling and interactions, Stocks and flows, Problems solving in agriculture through system analysis approach, Model formulation and estimation, Stereo type models, Model validations and evaluations.

AE 5164. Combustion of Biomass (2)
Introduction to energy management, Consumption in Sri Lanka and present systems of energy generations and utilization and comparisons with developing and developed countries, Combustion of Biomass and fossil fuels: Chemical reactions of combustion, physical and dynamic aspects of gas in combustion, Spontaneous expansion, Combustion of premixed gases, Diffusion flames, Laminar and turbulent, Biomass, Pyrolysis, Gasification and

liquefaction, Review of existing furnaces, gasifiers, Incinerators and dendro thermal systems, Design and control systems for new reactors with atmospheric pollution control systems.

AE 5165. Natural Fibre Technology (2)

Introduction to natural fibre use and management, Physical and chemical properties of wood, bamboo and other natural fibres, Martial fibre use in agriculture and forestry, 'technologies for manufacturing fibre materials for soil conservation measures and planting media, Preservation and treatment of natural fibres, Fibre board manufacture from agriculture wastes and other materials, Manufacture of organic resins and other tubes of glues, Paper manufacture, Construction methods using materials, Bamboo, thatch, grass, reeds, coir wastes, Assessment of future needs.

AE 5166. Water Resources Management for Tropical Agriculture (3)

Introduction to tropical climate, rainfall occurrence, patterns and distribution, Hydrological measurements, hydrological data analysis and interpretation, Surface water resources, Ground water resources, Soil moisture analysis and determination, Water movement through soil, plant and atmosphere, Hydrological processes and interactions, Consumptive use and crop water requirements, Irrigation scheduling, Water resource assessment and inventory, Sustainable management of tropical water resources.

AE 5167 Process Control and Automation (2)

Automation in process engineering; Sensors and transducers; Sensitivity and accuracy; Basic components used in robotic controls; Embedded systems; Micro-controllers; Programmers; Programming techniques; Debugging; In-circuit serial programming; Programming micro-controllers using the "C" language; Data acquisition (analog and digital); Minimizing errors in acquiring data; Development of a simple microprocessor based control system; Actuators; Operating actuators through a microprocessor; Operating relays/SSR, LCD displays, seven segment displays, stepper motors using microprocessors.

AE 5198. Directed Study and Seminar (2)

AE 6101. Advanced Irrigation Water Management (2)

Climatic environment in relation to irrigation. Selection, classification and preparation of irrigable land. Problems and procedures in determining water supply requirements irrigation projects. Water measurements. Selected problems on farm water management Importance of agricultural drainage, Determination of drainage spacing under steady state and unsteady state conditions Leaching requirement. Determination of drainage design parameters. Drainage systems design.

AE 6102. Advanced Geographical Information Systems (GIS) and Geo-informatics (2)

Introduction to Geo-informatics, Geo-informatics and spatial data quality, Temporal dimension in spatial data, Software and hardware for GIS/ Geo-informatics, Global Positioning Systems (GPS) for GIS and Geo-informatics, Remote Sensing (RS) and Geo-informatics, Spatial modeling, Simulations and Geo-computations, Legislation and Digital Data Products, Training and Education in Geo-informatics, Development of Geographical Information science.

AE 6103. Modeling Hydrological Systems (1)

Hydrological modeling concepts, Modeling approaches and applications, Process based modeling, Spatial dynamics and modeling, Temporal modeling, Scale issues in modeling, Data requirements and limitations for modeling.

AE 6106 Innovative Technologies for Mechanization in Plantation Industry (1)

Mechanization gaps in plantation industry, harvesting machines, processing machines, improvement of efficiency of existing machinery, future trends in mechanization.

GS 5101. Introduction to Geographical Information Systems (GIS) (2)

Introduction to GIS, Overview, History and concepts of GIS, Scope and application areas, Purpose and benefits of GIS, Functional elements of GIS, Mapping concepts, Map elements, Map scales and representation. Map projections and coordinate systems, Geometric rectification, Data structure, Data Compression techniques for data acquisition: Thematic mapping in GIS, Hardware and Software for GIS, Case studies.

GS 5102. Introduction to Remote Sensing (2)
Introduction to RS image processing: Pixel, Sampling & quantization, File formats. Image Enhancement: Image Statistics, Contrast enhancement, Color and color composites, Math Operation.

Geometric correction: Internal and external distortions, Map projection, Coordinate transformation formulae, Resampling and interpolation. RS Image classification: Classification of multi-spectral data, Unsupervised classification, Supervised classification, Principal component analysis, Post classification

GS 5103. Spatial Database Management (2)
Basic Concept of database management, database management systems, Spatial databases, Design and implementation of spatial databases, Spatial algorithms with application in GIS, Linking non-spatial and spatial database, database editing and updating, GPS data integration in GIS, Data manipulation and processing, Spatial analysis, Map generation, Charting and tabular representation. Mini-project for GIS database applications, Case studies

GS 5104. Fundamentals of Global Positioning Systems (GPS) (1)
GPS system description, Applications and status, GPS performance and Policy, GPS Constellation, Coverage and performance, GPS system concept and operation, Error sources & receiver effects, Introduction to DGPS, GPS receivers, Architectures and equipment

GS 5105. Surveying and Spatial Measurements (2)
Introduction to surveying, Surveying equipment, Mapping from surveying data, surveying and digital elevation models, Spatial measurement from surveying data, Accuracy estimations

GS 5198. Directed Study (5)
A brief study should be conducted on the advice of the Directed study coordinator and a submission of Study report is required.

GS 5199. Seminar (1)
A seminar presentation on an appropriate topic in consultation with the seminar coordinator is required.

GS 6101. Statistical Methods for Spatial Data Analysis (2)
Enhancement techniques, spatial sampling techniques, spatial data classification, Resampling techniques, Error of spatial data, Scale problems, Boundary problems, Modifiable unit problems.

GS 6102. Advanced Remote Sensing and Applications (2)
Digital remote Sensed data types and formats, Digital classification algorithms, Microwave remote sensing, Backscattering, Ground radar applications, Soil moisture and bathymetric measurements. Overview of RS application: Disaster management; Volcano, Flood, Forest fire, Agriculture application, Land use / land cover monitoring, Fishery and marine application, Coastal zone management, Urban monitoring, interaction between electromagnetic wave and targets: definition of radiometry, Refraction, absorption, diffusion, emission with radiometric terms and units, Spectral responses at various targets, Radiometric distortion and correction, Atmospheric correction, Satellite system and sensor, Higher-resolution optical satellites: LANDSAT, SPOT, ASTER, IRS, Moderate low resolution satellites: NOAA, MODIS synthetic Aperture Radar (SAR)

GS 6103. Recent Advances in Geo-Informatics (2)
Introduction to Geo-informatics, Geo-informatics and spatial data quality, software and hardware for Geo-informatics, Global Positioning System (GPS) for Geo-informatics, remote sensing (RS) and Geo Informatics, Simulations and Geo-Computations, Legislation and digital data products, Training and education in Geo-Informatics.

GS 6104. Spatial Data Infrastructure (1)
Introduction to Spatial data infrastructure, Global initiative for SDI, the need for national SDI, Data sharing, ownership and copy right issues, Spatial data for national initiatives.

AE 5202. Water Application Systems (2)
Selection of water application methods. Introduction to basin, border furrow and other surface irrigation methods, design, evaluation, operation and maintenance of surface irrigation systems, Introduction to design, Evaluation, Operation and maintenance of sprinkler and drip irrigation.

AE 5203. Food Process Engineering (2)
Introduction to processing food: Basic principles, raw materials, processing methods, Preliminary operations, Pre-treatments: trimming, peeling blanching: cross infection hazards, Flow: viscous and turbulent flow; multi-phase flow. Diffusive transfer of heat and mass, Conductive heat transfer. Thermal processing for microbial destruction, Non thermal processing for microbial destruction. Chilling and freezing, principles and practice, Freeze drying, theory of extrusion, Mixing, Distillation, Extraction, Concentration, Solid-Liquid separation. Equipment for filling, closing and heat sealing, Aseptic packing, Waste water treatment and disposal of food waste.

AE 5204. Power and Energy for Agriculture (2)
Principles and practices of renewable energy systems including solar-thermal solar-electric, dendro, hydro, wind, ethanol, biodiesel. Basic principles of thermodynamics, hydraulics and economics involved in the analysis of renewable energy systems in food and agricultural operations. Environmental impact of energy systems.

AE 5205. Ecologically Sustainable Industrial Development (1)
Introduction to Ecological sustainable Industrial Development Concepts (ESID); Environmental disasters, importance of ESID. Productivity concepts: Green productivity methodology, strategies and case studies, Cleaner production methodology, CP success stories. Environmental management systems; ISO 14000 methodology.

AE 5206. Fluid Mechanics (2)
Fundamentals of fluid flow, continuity, momentum and energy equations and their applications. Behaviour of real fluids, laminar flow, turbulent flow, steady flow in pipes, pipelines systems. Steady flow in open channels. Dimensional analysis and hydraulic similitude. Fluid machinery.

AE 5207. Applied Heat Transfer (2)
Introduction to heat transfer, Modes of heat transfer, Multimode heat and mass transfer, Diffusion mass transfer, Applications in agriculture.

AE 5209. Geographical Information Systems (GIS) for Natural Resource Management (2)
Introduction to GIS, Historical background, Development of GIS, Contributing disciplines and Technologies, Spatial information for decision making, Geographical Entities, Attribute data, Scale of spatial data, Spatial data Acquisition, Sources of Spatial data, Map References & Scales, Feature representation, Projections speciation in GIS, Digital Cartography, Data models, Comparison of model structures, Strengths & weaknesses, Data model selection, Storage structures of data base, Shared databases, Database design & management, GIS selection criteria, Data sources, Essential functionality, System specifications, Maintenance & log term sustainability, Training and awareness.

AE 5210. Health, Sanitation and Wastewater Management (2)
Health and Hygiene: Classification of water and excreta-related diseases, risk behaviors in relation to water and excreta-related diseases. On-site excreta disposal system: unimproved pit latrines, VIP latrines, pour-flush latrines, composting latrines, septic tanks and soaking systems. Urban sanitation: Excreta disposal in high density settlements, Wastewater treatment and reuse, Conventional low-cost sewage treatment, Unconventional systems, wastewater stabilization ponds and reed beds, Wastewater for irrigation

AE 5211. Hydraulics of Erosion and Sediment Transport (2)

Mechanism of soil erosion by rain drops and sheet flow, Erosion problems in irrigation lands, Open channels, Streams and watersheds. Principles of cohesive and non-cohesive sediment transport, Bed load functions and sedimentation problems in estuaries.

AE 5212. Water Supply (2)
Estimation of yield, surface and underground sources, Existing type of reservoirs and its efficiencies, Improvement of water supply reservoirs, river intakes, wells, including bore holes, Water quality control and management, Hydraulic of water conveyance systems and distribution, pumping plants, open channels, pipes valves and its repair ands maintenance.

AE 5213. Bioreactor and Bio-Environment Design and Control Systems (2)
Introduction to bioreactors: Bio-Mathematics applied in chemical kinetics, Identification of depended & independent variables & functional relationships of kinetics with enzymes and microbes (Inhibition, Toxicity, Catalytic & Process conditions), Design & operation of bioreactors for processing and effluent treatment, Constructed wetlands, Design & Development of control systems for bioreactors , Heat & mass transfer in bio- environment, Controlled environment in agriculture & constructed wetlands.

AE 5214. Electrical Power and Machines (2)
Measurement of AC voltages & currents , Average and RMS values, Use of complex numbers in AC circuit analysis, Transformers, Measurement of AC power, DC and AC motors, generators, Machinery.

AE 6104. Interdisciplinary Field Research methodology (3)
Introduction to the course, disciplinarity (discipline, multi-disciplinary, inter-disciplinary and trans-disciplinary), SPQR analysis, stakeholder identification; Sampling: qualitative and quantitative methods, data collection and PRA tools, data analysis (stakeholder analysis), report writing; Field visits – Formulation of research questions, conceptual frameworks and research proposal presentations & discussions; Water management: problem based learning (field works): water allocation, water measurements and demand management, conflict resolution, stakeholder participation, hydrological analysis.

AE 6105. Gender in Integrated Water Resources Management (2)
Importance of gender as a concept in IWRM, issues in gender and IWRM, Sex role stereotyping; Influence of social institutions in gender stereotyping, Gender tools in IWRM, Gender impact assessment, Behaviour and attitude about farming, irrigation, land and water development, Division of responsibilities and rights, Gender biases in agrarian institutions, Gender issues in domestic water sector, health and sanitation, industrial water sector, How water related technology influence on gender, Gendered impacts of large dams, Women empowerment and advocacy, Gender mainstreaming, Global trends in gender and water, National laws, policies and measurers, Strategies for empowerment and advocacy.

GS 5201. Fundamentals of Spatial Statistics (2)
Introduction to spatial statistics and GIS, Problems of descriptive statistics for spatial data, Univariate spatial statistics, Spatial distribution of data, Conversion of point to aerial data, Temporal analysis of spatial data, Spatial correlations, map comparison and analysis.

GS 5202. Thematic Mapping, Cartography and Photogammetry (2)
Introduction Overview and history, Concepts of cartography, Fundamentals of digital photogrammetry, analytical and digital photogrammetry, Point extraction, line extraction, Region extraction, classification, Examples, Matching methods and application, Image matching, DEM generation, Orthophoto generation, Digital mapping methods: Topographic mapping, Thematic mapping Applications.

GS 5203. Spatial Modeling and Analysis (2)
Introduction to spatial modeling, Digital Elevation Model (DEM) and Digital Terrain Models (DTM), raster modeling, Modeling Functionality in GIS.

GS 5204. Advanced GIS and Applications (3)

Development of GIS, Geographical information science, Temporal dimension in spatial data, Advanced GIS analysis and applications.

GS 5205.Advanced Digital Image Processing (2)
Types of Digital data, Digital Image corrections, Ground radiometric measurements, Field radiometry, Comparison of Classification methods, Photo scanning and geometric correction, Image filtring, Image Segmentation, Image feature extraction, Acquisition of digital images: continuous and discrete images, Direct digital recording, Scanning of analog images, Basic operations of digital images: Statistical characteristics of digital images, Homogeneous and inhomogeneous point operation, Geometric transformations, Resampling, Convolution, Segmentation and classification

GS 5206. Microwave Remote Sensing (2)
Introduction to Microwave Remote Sensing, Imaging RADAR signals and platforms; transmission and reception, Digital encoding, imaging geometry; spatial resolution, range resolution, Principles of SAR; frequency bands, RAR and SAR comparison, Geometric distortions; scale distortions – slant vs ground range, relief displacement, layover and foreshortening, shadow, parallax, motions, Radiometry of RADAR; effect of wavelength, incident angle, polarization, effects of surface roughness, speckle, SAR interferometry; DEM generation, earthquake detection and monitoring, monitoring volcanic movements and landslides, Applications of microwave remote sensing including SRTM data.