RESEARCH ENTRANCE TEST SYLLABUS

DHANALAKSHMI SRINIVASAN UNIVERSITY

Tiruchirappalli, Tamil Nadu – 621 112.

Office of Research &Innovation

Subject-wise Syllabus for Research Entrance Test

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Syllabus for Ph.D. - Management

Program	:	Doctor of Philosophy
Name of the School	:	School of Management
Discipline	:	MBA
Code	:	**MGT**

Title	Topics
Management Concepts & Organizational Behaviour	Principles of Management: Evolution of management thought, functions of management - Organizational Behaviour: Individual behaviour, personality, perception, motivation theories - Group dynamics, leadership theories, power and politics - Organizational structure, culture, and change management - Business Ethics, Corporate Social Responsibility (CSR)- Business Environment (micro & macro), sustainability.
Quantitative Techniques & Research Methodology	Quantitative Methods: Probability, statistics, hypothesis testing - Operations Research: Linear programming, decision theory - Data Analysis: Regression, correlation, forecasting - Research Methodology: Research design, sampling, data collection - Measurement scales, validity & reliability - Use of statistical software (basic awareness) - Academic writing and research ethics.
Functional Areas of Management	**Marketing Management:** Marketing concepts, STP, marketing mix, consumer behaviour, branding, digital marketing- Marketing research and analytics. **Financial Management:** Financial accounting, management accounting - Capital budgeting, cost of capital-Financial markets and instruments. **Human Resource Management:** HR planning, recruitment, training -Performance appraisal, compensation-Industrial relations. **Operations & Supply Chain Management:** Production planning and control - Inventory management, logistics-Quality management (TQM, Six Sigma basics).
Strategic Management, Entrepreneurship & Innovation	Strategic management process: formulation, implementation, evaluation- SWOT, PESTLE, Porter's Five Forces - Competitive strategies and business policy - Entrepreneurship: startup ecosystem, business models - Innovation management and design thinking-International business environment
Emerging Areas in Management & General Awareness	Business Analytics and Data-driven decision making - Artificial Intelligence applications in management - Digital transformation and Industry 4.0 -Corporate governance and sustainability -Global business trends and economic developments - Current affairs related to business, economy, and industry.

Syllabus for Ph.D. - Community Medicine/ Public Health Program

Program	:	Doctor of Philosophy
Name of the School	:	Srinivasan Medical College and Hospital
Discipline	:	Community Medicine / Public Health
Code	:	MED

Title	Topics
Epidemiology and Disease Dynamics	Concepts and evolution of epidemiology - Measures of disease frequency: Incidence, prevalence, mortality rates - Measures of association: Relative risk, odds ratio, attributable risk - Epidemiological study designs: Descriptive studies, Analytical studies (case-control, cohort) and Experimental studies (RCTs, field trials, community trials) - Screening for diseases: Criteria, validity, reliability - Bias, confounding, and effect modification - Infectious disease epidemiology - Transmission dynamics, Outbreak investigation, Surveillance systems Non-communicable disease epidemiology - Risk factors and prevention strategies - Emerging and re-emerging diseases - Epidemiological transition
Biostatistics and Data Science in Public Health	Types of data and measurement scales - Descriptive statistics: Mean, median, mode and Standard deviation, variance Probability and distributions- Normal, binomial, Poisson and Sampling techniques and sample size determination; Inferential statistics - Hypothesis testing, t-test, chi-square test, ANOVA; Correlation and regression analysis- Linear and logistic regression - Survival analysis and life tables - Multivariate analysis - Statistical software applications - SPSS / R / STATA - Data management and interpretation - Introduction to big data and data visualization in public health
Health Systems, Policies, and Programs	Structure of health care delivery system in India - Primary Health Care concept and implementation - National Health Mission (NHM) - National Health Programs: Communicable diseases (TB, HIV, Malaria), Non-communicable diseases (NPCDCS) Health policy and planning: Health policy formulation, Five-year plans and NITI Aayog perspective; Health management - Human resource management, Health logistics and supply chain; Health economics - Cost-effectiveness, cost-benefit analysis - Health indicators and health information systems - Universal Health Coverage (UHC) - Public-private partnerships in health
Social and Behavioral Sciences in Health	Social determinants of health - Concepts of health, illness, and disease - Health behavior theories - Health Belief Model - Theory of Planned Behavior - Cultural influences on health - Health communication and IEC/BCC strategies - Community participation and empowerment - Gender and health - Health equity and ethics - Qualitative research methods - Focus group discussions, In-depth interviews - Sociology and anthropology in public health

Title	Topics
Environmental and Occupational Health	Environmental health concepts - Water, air, and soil pollution; Waste management - Biomedical waste, Solid waste management Housing and sanitation - Climate change and health; Occupational health - Occupational hazards (physical, chemical, biological); Occupational diseases - Disaster management - Preparedness, mitigation, response - Environmental legislation in India

Syllabus for Ph.D. - Physiotherapy

Program	:	Doctor of Philosophy
Name of the School	:	Physiotherapy
Discipline	:	Physiotherapy
Code	:	PTY

Title	Topics
Basic Medical Sciences	Human Anatomy (Gross & Functional) - Human Physiology (General & Systemic) - Principles of Physiotherapy - Biomechanics & Kinesiology
Fundamentals of Physiotherapy	Exercise Therapy (Therapeutic Exercises) - Electrotherapy (Modalities & Applications) - Manual therapy - Evidence-Based Practice - Clinical Reasoning & Decision Making
Clinical Physiotherapy – I	Orthopaedic Physiotherapy - Fractures, Dislocations, Post-surgical rehabilitation, Arthritis & Musculoskeletal Disorders Sports Physiotherapy - Injury prevention & management, Rehabilitation protocols
Clinical Physiotherapy II	Neurological Physiotherapy - Stroke, SCI, Parkinsonism, Neuroplasticity & rehab techniques, Cerebral palsy , Neurosurgery Cardiopulmonary Physiotherapy - COPD, Restrictive Lung Disorders, Cardiac and Pulmonary rehabilitation, Congenital Heart Diseases, Heart Diseases and Surgeries - ICU & Critical Care Rehabilitation
Community based Physiotherapy and Women's Health	Community-Based Rehabilitation & Healthcare - Epidemiology & Public Health - Occupational Health & Ergonomics - Women's Health Physiotherapy - Antenatal & Postnatal Care
Advanced & Emerging Areas	Pain Management & Manual Therapy - Rehabilitation Technology (Robotics, AI) - Tele-rehabilitation - Evidence-Based Advanced Interventions - Ethics, Legal Aspects & Professional Issues

Syllabus for Ph.D. - Pharmacy

Program	:	Doctor of Philosophy
Name of the School	:	School of Pharmacy
Discipline	:	Pharmaceutical Sciences
Code	:	PHARM

Title	Topics
Pharmaceutics	**Pharmaceutics -** Introduction to dosage form, biological products, Pharmaceutical Plant, location, layout, Ophthalmic preparations, Pre-formulations, Packaging Materials, Cosmetics, Pilot plant scale-up techniques, Dosage Form Necessities and Additives, Powders, Sources of drug information, Tablets, Parenteral - product requiring sterile packaging, Suspensions, Emulsions, Suppositories. Stability of formulated products, Prolonged Action Pharmaceuticals. Novel Drug delivery system GMP and Validation Semisolids Capsules Liquids (solutions, syrups, elixirs, spirits, aromatic water, liquid for external uses) Pharmaceutical Aerosols **Physical Pharmacy -** Buffer, Solubility, Matter, properties of matter, Viscosity and rheology, Surface and interfacial phenomenon, Dispersion systems, Complexation, Micromeritics and powder rheology. **Pharmaceutical Jurisprudence** - Narcotic Drugs and Psychotropic Substances Act, and Rules, Introduction to Intellectual Property Rights and Indian Patent Act 1970, Prevention of Food Adulteration Act 1954 and Rules Industrial Development and Regulation act 1951, Drugs and Magic Remedies (Objectionable Advertisements) Act 1954, Medicinal and Toilet Preparations (Excise Duties) Act 1955, Rules 1976, Historical background Drug legislation in India, Code of Ethics for Pharmacists, The Pharmacy Act 1948 Drugs and Cosmetics Act 1940, Rules 1945, Medical Termination of Pregnancy Act 1970 and Rules 1975, Prevention of Cruelty to Animals Act 1960, Drug (Price Control) Order **Biopharmaceutics and Pharmacokinetics** - Bio-pharmaceutics, Bio-pharmaceutical statistics, Bio-availability & Bio-equivalence and study design. Solubility enhancement technique.
Pharmaceutical Chemistry	**Pharmaceutical organic Chemistry** General principles, Pericyclic reactions, Aromaticity & chemistry of aromatic compounds, Different classes of compounds Amino acids & proteins, Different aromatic classes of compounds, Polycyclic aromatic hydrocarbons, Stereochemistry, Carbohydrates, Carbonyl Chemistry, Heterocyclic, Chemistry Protection & deprotection of groups, Bridged rings, Kinetic & thermodynamic control

Title	Topics
	Pharmaceutical Inorganic Chemistry Dentifrices, desensitizing, agents, & anticaries agents, Pharmaceutical Impurities, Isotopes, Monographs, Medicinal Chemistry, Various classes of therapeutic agents, Different classes of therapeutic drugs, Therapeutic classes of drugs, Different classes of therapeutic drugs Pharmaceutical analysis Importance of quality control in pharmacy, Acid-base titrations Gravimetry, Extraction techniques, Potentiometry Calibration, General principles of spectroscopy, Mass spectrometry, Polarography, Nephelometry & Turbidimetry, Ultraviolet-visible Spectrometry, Spectro-fluorimetry, Flame photometry & atomic absorption spectrometry, Infrared spectrometry, Miscellaneous methods of analysis, Non-aqueous titrations, Oxidation-reduction titrations, Precipitation titrations, Complexometric titrations, Proton nuclear magnetic resonance spectrometry, Chromatograph **Biochemistry** Cell Lipids, Enzymes, Nucleic acids, Vitamins, Biological oxidations & reductions, Carbohydrates, Proteins, Hereditary diseases.
Pharmacology	**Human Anatomy and Physiology** Cell physiology, Endocrine Glands, Reproductive System, Gastrointestinal tract, Respiratory System, Autonomic nervous system, Cardiovascular system, Lymphatic system, The Blood Sense organs, Skeletal System, Central Nervous system, Urinary System. **Pharmacology** General Pharmacology, Principles of toxicology, Drugs acting on urinary system, Pharmacology of peripheral nervous system, Pharmacology of central nervous system, Pharmacology of cardiovascular system, Immuno-pharmacology, Drugs acting on Respiratory system, Pharmacology of Endocrine system Neuro-humoral transmission in autonomic and central nervous system, Vitamins & Minerals Chemotherapy Autacoids and their Antagonists, Pharmacology of drug acting on the gastrointestinal tract, Chrono pharmacology, **Clinical Pharmacy and Therapeutics** Drug information services, Drug interactions, Therapeutic drug monitoring, adverse drug reaction (ADR), types of ADR, Mechanism of ADR. Drug interaction, Monitoring and reporting of ADR and its significance, Age-related drug therapy: concept of posology, drug therapy for neonates, paediatrics and geriatrics. Drugs used in pregnancy and lactation, Drug therapy in gastrointestinal, hepatic, renal, cardiovascular and Respiratory Disorders **Pharmacovigilance, Therapeutic drug monitoring,**

Title	Topics
	Nutraceuticals, essential drugs and rational drug usage. General Principles, preparation, maintenance, analysis of observational records in Clinical Pharmacy Drug therapy in infections of the respiratory system, urinary system, infective meningitis, TB, HIV, malaria and filarial. Clinical trials, types and phases of clinical trials, placebo, ethical and regulatory issues including Good Clinical Practice in clinical trials, drug therapy for neurological and psychological disorders
Pharmacognosy	Pharmacognosy -Classification of crude drugs, Plant products - Principles of plant classification, Pharmaceutical aids, Animal products, Traditional herbal drugs, Plants based industries and research institutes in India, Patents. Ayurvedic system of medicine, Homoeopathic system of medicine, Toxic drugs, Enzymes, Natural pesticides and insecticides, Adulteration and evaluation of crude drugs, Quantitative microscopy, Factors influencing quality of crude drugs, Techniques in microscopy, Introduction to phytoconstituents, Biogenetic pathways, Carbohydrates & lipids, Tannins, Volatile oils, Resinous drugs, Glycosides.
Biotechnology	**Introduction to Microbiology** - Microscopy and staining technique, Biology of Microorganisms, Microbial spoilage, Vaccines & Sera, Fungi and Viruses, Aseptic Technique, Sterilisation & Disinfection, Microbial Assay. Plant Cell and Tissue Culture, Fermentation Technology and Industrial Microbiology, Recombinant DNA Technology Process and Applications, Animal Cell Culture, and Biotechnology-Derived Products.

Syllabus for Ph.D. – Agriculture (Soil Science)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Soil Science
Code	:	**SOIS**

Title	Topics
Biochemistry of Soil Organic Matter	Organic matter pools in soil; composition and distribution of organic matter in soil and its functions; environmental significance of humic substances; decomposition of organic residues in soil in relation to organic matter pools.
	Biochemistry of the humus formation; different pathways for humus synthesis in soil; soil carbohydrates and lipids.
	Nutrient transformation – N, P, S; trace metal interaction with humic substances, significance of chelation reactions in soils.
	Reactive functional groups of humic substances, adsorption of organic compounds by clay and role of organic substances in pedogenic soil aggregation processes; clay-organic matter complexes.
	Humus - pesticide interactions in soil, mechanisms.
	Colloidal chemistry of inorganic and organic components of soils – their formation, clay organic interaction. Predictive approaches for cation exchange equilibria - thermodynamics, empirical and diffuse double layer theory (DDL) - relationships among different selectivity coefficients; structure and properties of diffuse double layer.
Modern Concepts in Soil Fertility	Modern concepts of nutrient availability; soil solution and plant growth; nutrient response functions and availability indices.
	Nutrient movement in soils; nutrient absorption by plants; mechanistic approach to nutrient supply and uptake by plants; models for transformation and movement of major micronutrients in soils.
	Chemical equilibria (including solid-solution equilbria) involving nutrient ions in soils, particularly in submerged soils.
	Modern concepts of fertilizer evaluation, nutrient use efficiency and nutrient budgeting.
	Modern concepts in fertilizer application; soil fertility evaluation techniques; role of soil tests in fertilizer use recommendations; site-specific nutrient management for precision agriculture.
	Monitoring physical, chemical and biological changes in soils; permanent manurial trials and long-term fertilizer experiments; soil productivity under long-term intensive cropping; direct, residual and cumulative effect of fertilizer use.

Syllabus for Ph.D. – Agriculture (Agricultural Economics)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Agriculture (Agricultural Economics)
Code	:	**ECON**

Title	Topics
Theory of Consumer Behaviour	Theory of consumer behaviour – Duality in consumer theory - expenditure function and indirect utility function - Measurement of Income Effect and Substitution Effect. Measurement of Changes in Consumers' Welfare – Consumer's Surplus, Compensating Variation and Equivalent Variation -Dynamic versions of demand functions – Integrability of demand functions. Demand Models – Linear Expenditure System and Almost Ideal Demand System. Applications of consumer theory –Household model and time allocation – Labour supply decisions by households.
Producers Equilibrium under Different Market Structures	Advanced treatment of Perfect competition - Monopoly and Oligopoly. Oligopoly models – Cournot solution, Bertrand's Duopoly Model, Chamberlin model, Stackelberg solution – Game theoretic approach for oligopoly markets. Kinked Demand Curve – Equilibrium under Monopolistic Competition.
General Equilibrium	General Equilibrium Theory - Conditions and Concepts - General equilibrium with Production and Consumption. Walras' Law - Existence, Uniqueness and Stability of general competitive equilibrium. Walrasian general equilibrium.
Consequences of Violations of Basic Assumptions of Neoclassical Economic Theory	Market failure - Incomplete markets - Asymmetric information – Principal - Agent problem –Adverse selection - Moral hazard. Externalities – Network externalities - Public goods – Optimal provision of public goods
Welfare Economics and Public Choice	Welfare Economics - Concepts, Problems, Approaches and Limitations of Welfare Economics, Pareto conditions of maximum welfare – Edgeworth box approach, Social Welfare functions, Social versus Private costs and benefits. Public choice – Arrow's Impossibility Theorem.
Agricultural Marketing Research	Importance of market analysis in the agricultural system – types of marketing – advantages and disadvantages – quantitative estimation – the distinguishing characteristics and role of agricultural prices – data sources for agricultural products and prices – software used in market analysis.
Marketing Institutions	Role of various formal institutions in agricultural marketing – objectives and functions – measuring their efficiency – public-private-partnership – institutional arrangements. Successful case studies.
Market Analysis	Multi market estimation – Supply response models – Market integration and price transmission –Supply / Value chain

Title	Topics
	management – GAP analysis – Current trends in information in the changing agrifood system.
Commodity Marketing	Agricultural commodity marketing – Spot and futures – Marketing of derivatives - Speculation, hedging, swap, arbitrage etc. Commodity exchanges – Price discovery and risk management in commodity markets – Regulatory mechanism of futures trading – Forward Markets Commission.
Stochastic Processes and Forecasting Methods	Lag operators and difference equations – Stationary and stochastic processes – Unit roots and cointegration – Conditional heteroscedasticity – ARCH and GARCH models – Forecast evaluation –Methods of forecasting – Price indices and econometric estimation and simulation.

Syllabus for Ph.D. – Agriculture (Agricultural Extension)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Agricultural Extension
Code	:	**EXTN**

Title	Topics
Importance of Cyber Extension on Agricultural Information Dissemination	Cyber Extension or e- extension – Concept of cyber extension its role in agriculture and rural development - ICTs –definition – tools and application in extension education – Reorganizing the extension efforts using ICTs – advantages – limitations and opportunities.
E-Agriculture Initiatives and Extension Reforms	ICT programmes/ projects in agriculture – National and international cases of extension projects using ICT and their impact of agricultural extension – Different approaches (models) to ICTs – ICT use in field of extension – Expert systems on selected crops and enterprises – Self learning CDs on package of practices, diseases and pest management – Agricultural websites and portals related crop production and marketing etc. Digital Libraries and repositories for Agricultural Knowledge Management.
E-Agriculture Dissemination Strategies	Community Radio – Web, Tele, and Video conferencing – Computer Aided Extension – Knowledge management – Information kiosks – Multimedia – Online – Offline Extension Tools- Mobile technologies, e-learning concepts.
ICT Hardware and Software Tools	ICT tools- print and electronic media, e-mail, Internet, use of multimedia, use of mobile phony, computer-assisted instructions, touch screens, micro-computers, web technologies and information kiosks. Networking system of information and challenges in the use of ICT. E-learning, information resources, sharing and networking. Types of net work – PAN, LAN, WAN, Internet, AGRINET, AKIS, Indian National Agricultural Research database
Social Media In Opening Access To E- Agriculture	ICT Extension approaches – prerequisites, information and science needs of farming community – Need integration – Human resource information – Intermediaries – Basic e- extension training issues – ICT enabled extension pluralism – Emerging issues in ICT. Problems and prospects of ICTs in farm based development, Digitisation, Simulation models, Utilization of Internet for promoting advanced agricultural 56echnologies; communication with marginal, small and big farmers. Social Media – Platform and Tools for Sharing Agricultural Information and current stream of thoughts.
Basics of Instructional Design and Educational	Understanding various terms - educational technology, instructional design, instructional systems design, curriculum design, pedagogy, andragogy; Brief overview of the origin and evolution of ET and ID as theory and practice and relavance of ET

Title	Topics
Technology	and ID in extension and rural advisory services Concepts and theories of learning - Behaviorism, Cognitivism, Constructivism and Complex learning theories; instructional designers and learning theories; Types of learning or learning domains- Bloom's taxonomy of the cognitive domain, Krathwohl and Bloom's affective domain and Simpson's psychomotor domain.
Technology Enabled Learning	Role of technology in education; Digital media, new tools and technology and its applications in higher agricultural education; Open and distance Learning (ODL); Online Education, eLearning, Massive Open Online Courses – SWAYAM; Quality assurance and certification in e-learning.Open Education Resources (OERs), Course CERA, EduEx, CoL, RLOs; Smart classrooms and Campuses, Web-based remote laboratory (WBRL); types and implications of disruptive technologies for higher education and extension; Augmented learning; Adaptive learning; meaning, features and good practices in using open source Learning Management Systems (Moodle).
Instructional Design	Theories and Models of Instruction Howard Gardner's Theory of Multiple Intelligences, David Kolb's Experiential Learning Cycle, Albert Bandura's Social Learning Theory, Rand Spiro's Cognitive Flexibility Theory and Its Application In eLearning, Wlodkowski's Motivational Framework for Culturally Responsive Adult Learning; ADDIE Model, Dick and Carey Model, SAM Model, Bloom's Taxonomy; Overview of planning, designing and implementing the curricula; Needs Analysis of learners- meaning, approaches and steps; Task and content analysis of instruction - meaning, approaches, steps and techniques (topic analysis, procedural analysis, and the critical incident method); Learner analysis – meaning, importance and approaches, relevance of Maslow's Hierarchy of Needs and learning styles, Captive Audience vs. Willing Volunteers, Universal vs. user-centered design, Learner Analysis Procedures; Writing learning objectives: Meaning of Learning Goal and Learning Objectives; ABCDs of well-stated objectives; Setting goals, translating goals into objectives; Contextualising ADDIE process within the Extension learning environment.
Instructional Strategies and Evaluating Instruction	Organizing content and learning activities - scope and sequence of instruction; Posner's levels of organizing (Macro, Micro, Vertical, and Horizontal) and structures of organizing (content vs. media) instruction, Gagne's events of instruction, Edgar Dale's Cone of Experience; Methods of Delivery- classroom teaching, programmed instruction, synchronous and asynchronous modes of distance education; Changing role of a teacher in classroom and teaching competencies. Evaluating Instruction. Meaning of Assessment, Measurement and Evaluation; Developing learner evaluations and their reliability & validity; assessment techniques for measuring change in knowledge, skill and attitude of learners - Objective Test Items, Constructed-Response Tests,

Title	Topics
	Direct Testing, Performance Ratings, Observations and Anecdotal Records, Rubrics, Portfolios, Surveys and Questionnaires, Self-Reporting Inventories, Interviews; Conducting learner evaluation pre-, during and post-instruction; Formative and Summative Evaluation- meaning, approaches and steps; Evaluating Learner Achievement and the Instructional Design Process; Evaluating the success of instruction; Performance appraisal of teachers.
Trends in Instructional Design	Alternatives to ADDIE model - Rapid prototyping and constructivist ID, reflections on instructional design as science and as an art; Relating ID models and process in extension learning environment; political economy of higher education in developed and developing countries; University assessment and rating methods, returns from agricultural higher education; research in education and instructional design and current stream of thoughts.

Syllabus for Ph.D. – Agriculture (Agrnonomy)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Agronomy
Code	:	**AGRO**

Title	Topics
Weeds	Introduction, harmful and beneficial effects, classification and dissemination - Weed biology and ecology - Weed seed dormancy - Weed seed bank- Crop weed competition and allelopathy effect.
Herbicide	Herbicide classification, formulations, herbicide mixture, mode of action and selectivity, adjuvants and antidode, herbicide use efficiency, herbicide resistance and herbicide residuemanagement. Biotechnology approach in weed management development of transgenic herbicide-resistantcrops.Nanotechnology in herbicidal weed management; herbicide development, registration procedures.
Irrigation Methods	Conventional methods of irrigation, advanced irrigation methods, strategies of using limited water supply; factors affecting ET, control of ET by mulching and use of anti-transpirants; fertilizer use in relation to irrigation; optimizing the use of given irrigation supplies. Groundwater utilization and its impact on crop production, drainage and its management, management of poor-quality water, water production function, modeling in irrigation water management and economic analysis of irrigation.
Soil Fertility and Productivity	Soil fertility and productivity, Criteria of essentiality of nutrients; essential plant nutrients - their functions, nutrient deficiency symptoms; Soil health, problem soil, and their management, carbon sequestration. Manures – FYM, compost, green manures, vermicompost, bio-fertilizers, recycling of organic wastes and residue management. Organic farming - basic concepts and definitions.
Commercial fertilizers	Commercial fertilizers-solid and liquid; fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency. Time and methods of manures and fertilizers application; foliar application and its concept; integrated nutrient management; site-specific nutrient management, soil less cultivation.

Syllabus for Ph.D. Program – Agriculture (Entomology)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Agricultural Entomology
Code	:	**ENTO**

Title	Topics
Recent Trends in Integrated Pest Management	Principles of sampling and surveillance, forecasting, database management, and computer programming, simulation techniques and system analysis and modelling.
	Case histories of national and international programmes, their implementation, adoption and criticisms, global trade and risk of invasive pests; Updating knowledge on insect outbreaks and their management.
	Components of IPM: Insect behaviour in IPM- Concept of super-normal stimuli and behavioural manipulation as a potential tool in pest management, use of semio-chemicals, auditory stimuli and visual signals in pest management.
	Genetic engineering and new technologies- their progress and limitations in IPM programmes, deployment of benevolent alien genes for pest management- case studies; RNAi technology for pest management; Scope and limitations of bio-intensive and ecological-based IPM programmes.
	Application of IPM to farmers' real time situations; Challenges, needs and future outlook; dynamism of IPM under changing cropping systems and climate; insect pest management under protected cultivation; strategies for pesticide resistance management.
Molecular Techniques in Entomological Research	Introduction to molecular biology; techniques used in molecular biology; difference between prokaryotes and eukaryotes; Biomolecules- DNA, RNA, Protein; DNA replication, transcription, translation in prokaryotes (bacteria) and eukaryotes (insects).
	DNA and RNA analysis in insects and entomopathogens - Genomic DNA isolation, Qualitative and quantitative analysis of DNA, RNA isolation, Gel electrophoresis, Blotting techniques. DNA recombinant technology - genetic engineering/improvement in baculoviruses, Bt and entomopathogenic fungi.
	Insect cell lines; Genes of interest in entomological research-marker genes for sex identification, Peptides and neuropeptides, JH esterase, St toxins and venoms, chitinase, Bt toxin, trypsin inhibitors, CPTI; lectins and proteases. Transgenic plants for resistance to pest and diseases. Introduction of lectin genes for pest suppression.
	Insect gene transformation – Genetic improvement of predators and parasitoids for pesticide and temperature tolerance. DNA finger printing for taxonomy and phylogeny.
	DNA-based diagnostics; insect immune system in comparison to

Title	Topics
	vertebrates; molecular basis of metamorphosis; Application of RNAi for pest management; Molecular biology of insecticide resistance. Resistance management strategies in transgenic crops.

Syllabus for Ph.D. Program – Agriculture (Genetics and Plant Breeding)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Genetics and Plant Breeding
Code	:	**GEN-PB**

Title	Topics
Qualitative and quantitative techniques	Continuous variation-evolutionary studies; Genetic principles of continuous variation, Qualitative and quantitative techniques - differences, population types, approaches; various types of metrics, F2, F∞ and mixed; Selection of parents Simultaneous selection models; Use of Multiple regression analysis in selection of genotypes.
Gene action	Components of mean- Additive effect, breeding value, coefficient of gene dispersion, dominance; Simple scaling test, expectation of mean of character in various types of families in coupling and dispersed phase; Epistasis- Specification, weighted and un-weighted joint scaling test; Effect of linkage to generation mean, specification of mean to G × E interaction.
Components of variance	Components of variances-advantages, variances of different generations, balance sheet of variance; estimation of parameters-weighted and unweighted, least square analysis; random mating population; experimental population-BIPs, NCD-I, II, III, Triple test cross for random mating population and inbreds; Estimates of linkage and non-allelic interactions; Combining ability analysis, Hayman's Approach.
Stability analysis	G × E Interaction, stability and adaptability; Advanced models in stability analysis - Pattern analysis - Additive Main Effect and Multiplicative Interaction (AMMI) analysis and other related models; Merits and limitation of different stability analysis methods; Analysis and selection of genotypes; Methods and steps to select the best model - Biplots and mapping genotypes.
QTL Mapping	Construction of saturated linkage maps, concept of framework map development; QTLs- different types of markers and mapping populations, linkage maps, mapping- Strategies for QTL mapping - desired populations, statistical methods; MAGIC populations, Marker Assisted Selection (MAS) - Approaches to apply MAS in Plant breeding - selection based on markers - simultaneous selection based on marker and phenotype - Factors influencing MAS; Heritability of the trait, proportion of genetic variance, linkage disequilibrium between markers and traits and selection methods; Use of advanced software

Title	Topics
	packages for biometrical analysis, interpretation of analysed data.
Generation mean analysis	ABC scaling test and Joint scaling test- Analysis and interpretation; Estimation of variance of different filial generations and interpretations; Diallel analysis: Numerical, graphical and combining ability analysis; Triallel analysis; NCD - Designs: Triple test cross analysis; Stability analysis: Eberhart and Russel model; AMMI model - Principal Component Analysis model - Additive and multiplicative model - Shifted multiplicative model - Analysis and selection of genotypes - Methods and steps to select the best model - Selection systems - Biplots and mapping genotypes; Construction of linkage maps and QTL mapping - Strategies for QTL mapping; statistical methods in QTL mapping; Phenotype and Marker linkage studies; Use of advanced software in biometrical analysis.
Structure of Genome	Organization and structure of genome, Genome size, Organization of organellar genomes, Nuclear DNA organization, Nuclear and Cytoplasmic genome interactions and signal transduction; Inheritance and eXpression of organellar DNA; Variation in DNA content - C value paradoX; Sequence compleXity – Introns and EXons, Repetitive sequences, Role of repetitive sequence.
Karyotype	Karyotyping – Chromosome banding and chromosome painting; Tracking introgressions using FISH, GISH, localization and mapping of genes/ genomic segments.
Pre-breeding methods	Pre-breeding and applications of cytogenetical methods for crop improvement; Location and mapping of genes on chromosomes: deficiency method; Interchange genetic consequence, identification of chromosomes involved and gene location; balanced lethal systems, their maintenance and utility; Multiple interchanges-usein producing inbreds, transfer of genes- linked marker methods; Duplication - production and use; Inversions and location of genes; B/ A chromosome translocations and gene location.
Trisomics	Trisomics- types, production, breeding behavior and location of genes, use of balanced tertiary trisomics in hybrid seed production; Monosomics methods of production, breeding behavior and location of genes; Intervarietal substitutions- allelic and non-allelic interactions; Telocentric method of mapping.
Cytogenomics and polyploidy	Cytogenomics: Concept, tools and techniques for crop improvement; Chromosome sorting: Isolation of specific chromosome for development of molecular maps and gene location. Role of polyploidy in crop evolution and breeding. Auto- and allopolyploids; Distant

Title	Topics
	hybridization, barriers to interspecific and intergeneric hybridization; Behaviour of interspecific and intergeneric crosses.

Syllabus for Ph.D. Program – Agriculture (Horticulture)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Horticulture
Code	:	**HORT**

Title	Topics
Vegetable Science	Solanaceous crops: Tomato, brinjal, chilli, sweet pepper and potato Colecrops: Cabbage, cauliflower and knol-khol, sprouting broccoli, Okra, Onion, Peas and beans, amaranth and drumstick Rootcrops and cucurbits: Carrot, beetroot, turnip, radish and cucurbits Tubercrops: Sweet potato, Cassava, Elephant foot yam, Dioscorea and taro
Fruit Science	General Concepts and Current Scenario: National and International scenario, national problems. Propagation, Planting Systems and Crop Regulation: Recent advances in propagation – root stocks, planting systems, high-density planting, crop modelling, Precision farming, decision support systems – aspects of crop regulation- physical and chemical regulation Overcoming Stress and Integrated Approaches: Effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management, Physiological disorders, Total quality management (TQM), Current topics. Mango, Banana, Grapes, Citrus, Papaya, Litchi, Guava, Pomegranate, Apple, Pear Peach, Plum, Apricot, Cherry, Almond, Walnut, Pecan, Strawberry, Kiwifruit
Medicinal and Aromatic Plants	Genetic bio-diversity of medicinal plants, Conservation networks, Global initiatives on medicinal plants, Conservation and development, Export and import status, Advanced research in bio-medicines, Nutraceuticals and natural drugs, Role of institutions and NGO's in production. GAP in medicinal crop production. Indian traditional wisdom and heritage, Indian herbal wealth, Documentations, databases, scientific validation, Production problems of medicinal and aromatic plants, Classification of medicinal crops, Systems of cultivation, Organic production. Production technologies with reference to crop improvement, climate, soil and substrate culture, Improved varieties , Organic production , Nutrition and irrigation requirements , Interculture, Mulching , Weed

Title	Topics
	control, Maturity indices , Harvesting and economics of cultivation of the crops Senna, Periwinkle, Coleus, Ashwagandha and Glory lily Production technologies with reference to crop improvement, climate, soil and substrate culture, Improved varieties, Organic production, Nutrition and irrigation requirements, Inter-culture, Mulching, Weed control, Maturity indices, Harvesting and economics of cultivation of the crops -Sarpagandha, Medicinal solanum, Isabgol and Safed Musli. Production technologies with reference to crop improvement, climate, soil and substrate culture, Improved varieties, Organic production , Nutrition and irrigation requirements, Interculture, Mulching, Weed control, Maturity indices, Harvesting and economics of cultivation of the following crops - Dioscroeasp, Aloe vera, Stevia and Gymnema
Floriculture and Landscaping	Commercial flower production; Scope and importance; Global Scenario in cut flower& loose flower production and trade, varietal wealth and diversity; Special characteristics and requirements; cut flower, loose flowers, dry flowers trade. Propagation and multiplication; IPR issues related to propagation of materials; Growing conditions — in open & Greenhouse; Crop specific requirement of Media and Environment--influence of environmental parameters, light, temperature, moisture, humidity and CO2 on growth and flowering; regulation for quality flowers.; Nutrient (slow release fertilizers and biofertilizers) & water management Flower forcing and year-round flowering through physiological interventions; Chemical regulation; Environmental manipulation; Harvest indices; Harvesting techniques; Post-harvest handling; Precooling, pulsing, packing, marketing; Export potential; Agri Export Zones. Crop specific practices – rose, anthurium, orchids, carnation, chrysanthemum, gladioli, gerbera, liliums, bird of paradise

Syllabus for Ph.D. Program – Agriculture (Agricultural Nanotechnology)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Agricultural Nanotechnology
Code	:	**AGRNANO**

Title	Topics
Precision Agriculture Fundamentals	Concepts & techniques of Precision Agriculture Indian farming challenges, yield monitoring, and crop simulation models for resource optimisation.
Geo-Informatics Applications	Focuses on GIS/RS basics, image processing, spectral profiles, soil fertility mapping, supervised classification, and management zones via multispectral data.
Nanotechnology Basics	Introduces nanoscale physics/chemistry, nanoparticle types, properties, synthesis methods, and effects on plant uptake/delivery.
Nano-Inputs in Farming	Details nano-fertilisers, nano-pesticides, nano-seeds, controlled-release systems, and water management for enhanced productivity.
Nano-Sensors and Integration	Explores nano-sensors for biomarker/stress detection, IoT-GIS-nano fusion, VRT/STCR prescriptions, GPS surveys, and project execution.

Syllabus for Ph.D. Program – Agriculture (Plant Pathology)

Program	:	Doctor of Philosophy
Name of the School	:	School of Agricultural Sciences
Discipline	:	Plant Pathology
Code	:	**AGRPLP**

Title	Topics
History and Principles of Plant Pathology	Milestones in phytopathology (India focus), major epidemics and social impacts, development of protection measures, classification of plant diseases, Koch's postulates, pathogen survival and dispersal, factors influencing infection and symptom development.
Laboratory and Analytical Techniques	Media preparation, sterilization, isolation and identification of pathogens, inoculation methods, molecular diagnostics (ELISA, PCR, hybridization), and use of laboratory equipment (autoclave, laminar flow, spectrophotometer, microscopy, GC-MS, HPLC, thermocycler).
Physiological and Molecular Plant Pathology	Plant metabolic changes under stress, molecular mechanisms of pathogenesis, enzymes/toxins, resistance mechanisms (R-genes, phytoalexins, PR proteins, SAR/ISR), genetic engineering tools (RNAi, plantibodies, hypovirulence, cross protection).
Mycology	Classification of fungi (Kirk et al., 2008), life cycles of phytopathogenic fungi, economic mycology, edible and entomogenous fungi, mycorrhizal associations, fungal cell organelles and composition.
Plant Bacteriology	Identification and classification, ultrastructure of prokaryotic cells, bacterial genetics (transformation, conjugation, transduction), plasmids, bacteriophages, variability, fastidious prokaryotes (phytoplasmas), and economic uses of prokaryotes.
Plant Virology	Nature, composition, classification, variability, satellite viruses, detection and diagnosis (biological, serological, molecular), virus replication and movement, histopathological changes, virus-vector relationships.
Plant Disease Epidemiology	Concepts of monocyclic/polycyclic pathogens, environmental influences, survey and surveillance, forecasting models, crop loss assessment, decision support systems, GPS/GIS applications.
Phanerogamic Parasites and Non-Parasitic Diseases	Diseases caused by parasitic flowering plants, abiotic stresses (soil, drought, flooding), nutritional deficiencies, pollution-related diseases.
Fungal Diseases of Crop Plants	Etiology, disease cycles, epidemiology, and management of fungal diseases in cereals, pulses, oilseeds, fruits, vegetables, plantation crops, spices, medicinal plants.
Bacterial and Viral Diseases of Crop Plants	Major crop diseases caused by bacteria, viruses, viroids, phytoplasmas; transmission, epidemiology, and integrated management.
Management of Plant Diseases	Plant quarantine, exotic pathogens, WTO/TRIPS issues, breeding for resistance (gene-for-gene hypothesis), seed health and certification,

Title	Topics
	fungicides/antibiotics (classification, bioassay, resistance), cultural practices, solarization, IDM, biocontrol agents, PGPR, biotechnology in disease management.

Syllabus for Ph.D. Program – Agriculture Engineering

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Agriculture Engineering
Code	:	SET-AGRI

Title	Topics
Engineering Mathematics & Basic Engineering Sciences	Linear algebra, calculus, differential equations - Probability and statistics - Numerical methods - Engineering physics (basic principles) - Engineering chemistry (soil-water-material relevance) - Basics of electrical & electronics engineering - Computer programming fundamentals.
Soil, Water & Irrigation Engineering	Soil mechanics (soil properties, classification, permeability) - Soil-water-plant relationships - Irrigation engineering (methods, scheduling, efficiencies) - Groundwater hydrology - Watershed management - Drainage engineering - Hydrology (precipitation, runoff, infiltration).
Farm Machinery & Power Engineering	Farm power sources (IC engines, tractors) - Farm machinery (tillage, sowing, harvesting equipment) - Farm mechanization - Renewable energy in agriculture (solar, biogas, biomass) - Farm electrification - Operation, maintenance, and management of machinery.
Agricultural Processing, Structures & Environmental Engineering	Post-harvest technology (drying, storage, processing) - Food engineering basics - Agricultural structures (farm buildings, greenhouses) - Rural engineering (roads, water supply systems) - Environmental engineering (waste management, pollution control) - Cold storage and supply chain basics.
Agricultural Systems, Management & Research Methodology	Agricultural economics and farm management - Cropping systems and agronomy (basic concepts) - Precision agriculture and smart farming - GIS, remote sensing (basic applications) - Research methodology: Research design and hypothesis formulation, Experimental methods in agriculture, Data analysis and interpretation, Research ethics and scientific writing.

Syllabus for Ph.D. Program – Biomedical Engineering

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Biomedical Engineering
Code	:	BMD

Title	Topics
Engineering Mathematics & Basic Engineering Sciences	Linear algebra, matrices, eigenvalues - Differential and integral calculus - Differential equations (ODE & PDE basics) - Probability and statistics (biostatistics basics) - Numerical methods - Engineering physics (waves, electromagnetics) - Engineering chemistry (biomaterials perspective) - Basics of electrical, electronics, and programming.
Human Anatomy, Physiology & Biomechanics	Cell biology and tissue structure - Human anatomy (organ systems overview). Physiological systems: Cardiovascular, Respiratory, Nervous system. Bioelectric phenomena - Biomechanics (musculoskeletal system, fluid mechanics in physiology).
Biomedical Instrumentation & Sensors	Physiological signal measurement (ECG, EEG, EMG) - Biomedical sensors and transducers - Medical instrumentation systems and safety - Signal acquisition and conditioning - Diagnostic and therapeutic equipment - Hospital instrumentation and standards.
Biomedical Signal Processing, Imaging & Biomaterials	Biomedical signal processing: Time and frequency domain analysis, Filtering and noise reduction. Medical imaging: X-ray, CT, MRI, Ultrasound basics, Image processing fundamentals. Biomaterials: Properties, biocompatibility, Implants and prosthetics. Tissue engineering (basic concepts).
Advanced Biomedical Engineering & Research Methodology	Bioinformatics and computational biology (basics) - Medical robotics and AI in healthcare - Wearable devices and IoT in healthcare - Healthcare systems engineering. Research methodology: Research design and hypothesis formulation, Literature review and problem identification, Experimental methods and clinical data analysis, Research ethics and biomedical regulations.

Syllabus for Ph.D. Program – Biotechnology

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Biotechnology
Code	:	BIOT

Title	Topics
Engineering Mathematics, Basic Sciences & Computing	Linear algebra, calculus, differential equations - Probability and statistics (biostatistics) - Numerical methods - Engineering physics (basic concepts) - Engineering chemistry (biomolecular perspective) - Basics of electrical/electronics engineering -Programming fundamentals and computational tools.
Basic Biological Sciences	Cell biology (structure, function, cell cycle). Biochemistry: Biomolecules (proteins, carbohydrates, lipids, nucleic acids), Enzymes and kinetics. Microbiology: Bacteria, viruses, fungi, Growth kinetics and control. Genetics: Mendelian genetics, Molecular genetics. Immunology (basic concepts).
Molecular Biology & Genetic Engineering	DNA replication, transcription, translation - Gene regulation and expression - Recombinant DNA technology - Gene cloning and vectors - Genomics and proteomics - CRISPR and modern gene-editing tools (basic awareness).
Bioprocess Engineering & Industrial Biotechnology	Principles of bioprocess engineering - Bioreactor design and operation - Fermentation technology - Downstream processing - Enzyme technology - Industrial biotechnology applications - Environmental biotechnology.
Applied Biotechnology & Research Methodology	Bioinformatics and computational biology - Medical and pharmaceutical biotechnology - Plant and animal biotechnology - Tissue engineering and regenerative medicine (basics) - Nanobiotechnology (overview). Research Methodology: Research design and hypothesis formulation, Experimental techniques in biotechnology, Data analysis and interpretation, Scientific writing and publication, Bioethics, biosafety, and IPR.

Syllabus for Ph.D. Program – Chemistry

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Chemistry
Code	:	CHEM

Title	Topics
Physical Chemistry	Atomic structure and quantum mechanics - Chemical bonding and molecular structure - Thermodynamics (laws, free energy, equilibrium) - Chemical kinetics (rate laws, catalysis) - Electrochemistry (cells, electrodes, batteries) - Surface chemistry and colloids.
Organic Chemistry	Structure and bonding in organic molecules. Reaction mechanisms: Substitution, elimination, addition reactions. Stereochemistry (chirality, isomerism) - Functional group chemistry - Aromatic compounds and heterocyclic chemistry - Organic spectroscopy (UV, IR, NMR basics).
Inorganic Chemistry	Periodic properties and chemical bonding theories - Coordination chemistry (complexes, ligand field theory) - Transition and inner transition elements - Organometallic chemistry (basic concepts) - Bioinorganic chemistry (metals in biological systems).
Analytical & Applied Chemistry	Analytical techniques: Chromatography, Spectroscopy, Electroanalytical methods. Environmental chemistry: Water treatment, Pollution control. Industrial chemistry: Fuels, polymers, and materials. Nanochemistry and green chemistry.
Advanced Chemistry & Research Methodology	Advanced topics (overview): Computational chemistry, Medicinal chemistry, Materials chemistry. Research Methodology: Research design and hypothesis formulation, Experimental techniques and data analysis, Instrumentation in chemical research, Scientific writing and publication, Research ethics and safety.

Syllabus for Ph.D. Program – Computer Science and Engineering (All Branches)

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Computer Science and Engineering (All Branches)
Code	:	CSE

Title	Topics
Engineering Mathematics & Foundations of Computing	Discrete mathematics: Logic, sets, relations, functions, Graph theory, combinatorics. Linear algebra (matrices, eigenvalues) - Probability and statistics - Numerical methods (basic concepts). Theory of computation: Finite automata, Regular expressions, Turing machines (basics).
Programming, Data Structures & Algorithms	Programming concepts (C/C++/Python basics). Data structures: Arrays, linked lists, stacks, queues, Trees, graphs, hashing. Algorithm design techniques: Divide and conquer, Greedy methods, Dynamic programming. Algorithm analysis (time and space complexity).
Operating Systems	Operating systems: Process management, Memory management, File systems. Database management systems: ER models, SQL, Normalization, Transactions. Computer networks: OSI/TCP-IP models, Routing, congestion control, Network security basics. Computer organization and architecture: CPU, memory hierarchy, Instruction sets.
Software Engineering, AI & Emerging Technologies	Software engineering: SDLC models, Testing and quality assurance, Agile methodologies. Artificial Intelligence: Search techniques, Machine learning basics, Neural networks (introductory concepts). Data science: Data preprocessing, Basic analytics. Cyber security: Cryptography basics, Network security. Cloud computing and IoT (overview).
Advanced Computing & Research Methodology	Advanced topics (overview level): Big data analytics, Distributed systems, Blockchain basics. Research methodology: Research design and problem formulation, Literature review and hypothesis development, Data collection, analysis, and interpretation, Research ethics and publication practices.

Syllabus for Ph.D. Program – Electronics and Communication Engineering

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Electronics and Communication Engineering
Code	:	ECE

Title	Topics
Engineering Mathematics & Basic Engineering Sciences	Linear algebra, matrices, eigenvalues - Differential and integral calculus - Ordinary and partial differential equations - Probability and statistics - Numerical methods - Engineering physics (electromagnetic concepts) - Basic electrical engineering - Programming fundamentals.
Electronic Devices, Circuits & Network Theory	Semiconductor physics and devices (diodes, BJT, MOSFET) - Analog circuits (amplifiers, feedback, oscillators). Network theory: Circuit laws and theorems, Transient and steady-state analysis, Two-port networks. Operational amplifiers and applications.
Signals, Systems & Communication Engineering	Signals and systems: Continuous and discrete-time signals, Fourier series and transforms, Laplace and Z-transforms. Communication systems: Analog communication (AM, FM, modulation techniques), Digital communication (sampling, PCM, modulation schemes), Noise and information theory basics.
Digital Systems, Microprocessors & Control Systems	Digital electronics: Logic gates, Boolean algebra, Combinational and sequential circuits. Microprocessors and microcontrollers: Architecture and programming basics. Control systems: Transfer functions, Stability analysis, Time and frequency response. Instrumentation basics (sensors, transducers).
Advanced ECE Topics & Research Methodology	Digital signal processing (basics) - VLSI design fundamentals - Embedded systems (overview) - Wireless and mobile communication basics - Optical communication fundamentals - Internet of Things (IoT) and modern communication systems. Research methodology: Research design and problem formulation, Literature review and hypothesis development, Data analysis and interpretation, Research ethics and publication practices.

Syllabus for Ph.D. Program – Electrical and Electronics Engineering

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Electrical and Electronics Engineering
Code	:	EEE

Title	Topics
Engineering Mathematics & Basic Engineering Sciences	Linear algebra, matrices, eigenvalues - Differential and integral calculus - Differential equations (ODE & PDE basics) - Probability and statistics - Numerical methods - Engineering physics (electromagnetism basics) - Basic electrical engineering concepts - Programming fundamentals.
Electrical Circuits, Fields & Network Theory	Circuit analysis (DC & AC, network theorems) - Transient and steady-state analysis - Two-port networks - Electromagnetic field theory (electrostatics, magnetostatics, EM waves basics) - Network functions and frequency response.
Electrical Machines, Power Systems & Power Electronics	Electrical machines: Transformers, DC machines, Induction motors, Synchronous machines. Power systems: Generation, transmission, distribution, Power system analysis (load flow, faults basics), Protection and switchgear. Power electronics: Semiconductor devices, Converters, inverters, choppers, Applications in drives and power systems.
Electronics, Control Systems & Instrumentation	Analog electronics (diodes, transistors, amplifiers) - Digital electronics (logic gates, combinational & sequential circuits) - Microprocessors and microcontrollers (basic architecture). Control systems: Transfer functions, Stability analysis, Time and frequency response. Instrumentation and measurements: Sensors and transducers, Measurement systems.
Advanced Topics & Research Methodology	Signal processing basics - Communication systems fundamentals - Renewable energy systems (solar, wind integration) - Smart grids and modern power systems - Embedded systems and automation (overview). Research methodology: Research design and problem identification, Literature review and hypothesis formulation, Data analysis and interpretation, Research ethics and publication practices.

Syllabus for Ph.D. Program – English

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	English
Code	:	**ENG**

Title	Topics
British, American & Indian Literature	British Literature: Chaucer to Modern Age, Shakespeare, Milton, Romantic poets, Victorian novelists. American Literature: Transcendentalism, Modernism, Major authors (Emerson, Whitman, Hemingway, Faulkner). Indian Writing in English: Poetry, fiction, drama, Postcolonial literature. World Literature (basic exposure).
Literary Theory & Criticism	Classical criticism (Plato, Aristotle) - Neo-classical and Romantic criticism. Modern literary theory: Structuralism and Post-structuralism, Feminism, Marxism, Psychoanalysis, Postcolonialism. Practical criticism and textual analysis.
Linguistics & English Language Studies	Fundamentals of linguistics: Phonetics and phonology, Morphology and syntax, Semantics and pragmatics. Sociolinguistics and discourse analysis - History of English language - English language teaching (ELT) basics.
Communication Skills & Applied English	Fundamentals of communication: Verbal and non-verbal communication, Listening, speaking, reading, writing (LSRW skills). Technical and professional communication: Report writing, Technical descriptions, Business correspondence. Presentation skills, group discussion, interviews - Digital communication and workplace communication.
Academic Writing	Academic writing: Essays, dissertations, theses. Referencing styles (MLA, APA basics) - Plagiarism and research ethics.

Syllabus for Ph.D. Program – Mathematics

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Mathematics
Code	:	**MAT**

Title	Topics
Linear Algebra & Abstract Algebra	Vector spaces, subspaces, linear transformations - Matrices, eigenvalues, eigenvectors - Systems of linear equations. Group theory: Groups, subgroups, cyclic groups, Homomorphisms and isomorphisms. Ring theory and fields (basic concepts).
Real Analysis & Complex Analysis	Real analysis: Sequences and series, Continuity and differentiability, Riemann integration. Metric spaces and convergence. Complex analysis: Analytic functions, Complex integration, Residue theorem.
Differential Equations & Applied Mathematics	Ordinary differential equations (ODE) - Partial differential equations (PDE) - Boundary value problems - Vector calculus - Laplace transforms and Fourier series - Applications in physical and engineering systems.
Probability, Statistics & Numerical Methods	Probability theory: Random variables, Probability distributions. Statistical methods: Estimation and hypothesis testing, Regression and correlation. Numerical methods: Solutions of equations, Interpolation and approximation, Numerical integration and differentiation.
Advanced Mathematics	Functional analysis (basic concepts) - Topology (introductory concepts) - Graph theory and combinatorics - Optimization techniques (linear programming basics). Research Methodology: Research design and problem formulation, Mathematical modelling, Proof techniques and logical reasoning, Literature review and academic writing, Research ethics.

Syllabus for Ph.D. Program – Mechanical Engineering

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Mechanical Engineering
Code	:	**MECH**

Title	Topics
Engineering Mathematics & Basic Engineering Sciences	Linear algebra, matrices, eigenvalues - Differential and integral calculus - Ordinary and partial differential equations - Probability and statistics - Numerical methods - Engineering physics (basic concepts) - Engineering chemistry (materials perspective) - Basic electrical & electronics engineering.
Engineering Mechanics & Design Fundamentals	Engineering mechanics: statics and dynamics - Strength of materials (stress, strain, bending, torsion) - Theory of machines (kinematics and dynamics of mechanisms) - Vibrations (basic concepts) - Machine design fundamentals -Engineering drawing and graphics.
Thermal Engineering	Thermodynamics (laws, properties, cycles) - Applied thermodynamics (IC engines, gas turbines, steam systems) - Fluid mechanics (fluid statics, dynamics, boundary layer) - Heat transfer (conduction, convection, radiation) - Refrigeration and air conditioning.
Manufacturing, Materials & Industrial Engineering	Manufacturing processes (casting, forming, machining, welding) - Metrology and instrumentation - Materials science and engineering (properties, phase diagrams) - Production and operations management - Industrial engineering (work study, optimization basics) - Quality control (TQM, Six Sigma basics).
Advanced Mechanical Engineering & Research Methodology	CAD/CAM, CNC, automation - Mechatronics and robotics (basics) - Computational tools (basic FEM/CFD awareness) - Renewable energy systems (overview) - Research methodology: Research design and problem formulation, Literature review and hypothesis testing, Data analysis and interpretation, Research ethics and publication.

Syllabus for Ph.D. Program – Physics

Program	:	Doctor of Philosophy
Name of the School	:	School of Engineering and Technology
Discipline	:	Physics
Code	:	**PHY**

Title	Topics
Mathematical Physics & Classical Mechanics	Vector calculus and coordinate systems - Linear algebra and matrices - Differential equations and special functions. Classical mechanics: Newtonian mechanics, Lagrangian and Hamiltonian formulation, Oscillations and rigid body dynamics.
Electromagnetic Theory & Optics	Electrostatics and magnetostatics - Maxwell's equations and electromagnetic waves - Wave propagation and transmission. Optics: Interference, diffraction, polarization, Laser physics and fiber optics.
Quantum Mechanics & Atomic Physics	Wave-particle duality and Schrödinger equation - Operators, eigenvalues, and eigenfunctions - Quantum systems (particle in a box, harmonic oscillator) - Atomic structure and spectra - Basics of nuclear physics.
Thermodynamics, Statistical Physics & Solid-State Physics	Thermodynamics: Laws of thermodynamics, Thermodynamic potentials. Statistical mechanics: Maxwell-Boltzmann, Fermi-Dirac, Bose-Einstein statistics. Solid-state physics: Crystal structure, Band theory, Semiconductors and devices.
Electronics, Computational Physics & Research Methodology	Analog and digital electronics (basic circuits, amplifiers) - Instrumentation and measurement techniques - Computational physics (numerical methods, simulations basics) - Nanotechnology and modern physics applications. Research Methodology: Research design and problem formulation, Experimental and theoretical methods, Data analysis and interpretation, Scientific writing and publication, Research ethics.

Syllabus for Ph.D. Program – Bio-Chemistry

Program	:	Doctor of Philosophy
Name of the School	:	School of Allied Health Sciences
Discipline	:	Biochemistry
Code	:	**BIOCHM**

Title	Topics
Biomolecules	Amino acids – structure, classification, stereochemistry (L and D forms), ionisation states and pKa values; peptide bond geometry and properties. Proteins – primary, secondary (α-helix, β-sheet, β-turn), tertiary, and quaternary structure; forces stabilising protein structure; protein folding, denaturation, and renaturation. Carbohydrates – monosaccharides (aldoses and ketoses), disaccharides, oligosaccharides, and polysaccharides; glycosidic bond formation; anomers and epimers; structures of starch, glycogen, cellulose, and chitin. Lipids – fatty acid nomenclature and structure; saturated and unsaturated fatty acids; phospholipids, glycolipids, sterols, sphingolipids, and waxes. Nucleotides and nucleic acids – purine and pyrimidine bases; ribose and deoxyribose; phosphodiester backbone; Watson–Crick base pairing; DNA double helix and secondary structures of RNA (mRNA, tRNA, rRNA). Vitamins and coenzymes – structure and function of fat-soluble vitamins (A, D, E, K) and water-soluble vitamins (B1, B2, B3, B5, B6, B7, B9, B12, C); role of NAD+/NADH, FAD/FADH2, Coenzyme A, THF, PLP, and TPP in metabolism.
Enzymology	Classification and nomenclature of enzymes (IUB system); active site structure and properties; enzyme–substrate interaction models (lock-and-key and induced fit). Enzyme kinetics – Michaelis–Menten equation; derivation and significance of Km, Vmax, kcat, and catalytic efficiency (kcat/Km); Lineweaver–Burk and Eadie–Hofstee plots. Enzyme inhibition – competitive, uncompetitive, mixed, and non-competitive inhibition; effects on Km and Vmax; IC50 and Ki determination. Allosteric regulation and cooperativity – sigmoidal kinetics; Hill equation and Hill coefficient; homotropic and heterotropic effectors; R and T states (MWC concerted model). Enzyme catalytic mechanisms – acid-base catalysis, covalent catalysis, metal ion catalysis, proximity and orientation effects, transition-state stabilisation. Mechanisms of serine proteases (chymotrypsin, trypsin, elastase), cysteine proteases, and aspartyl proteases – catalytic triad, oxyanion hole, and reaction intermediates. Zymogen activation; multienzyme complexes; isozymes; covalent modification (phosphorylation); feedback inhibition and feed-forward activation.
Metabolism and Bioenergetics	Bioenergetics – free energy (ΔG, ΔG°'), high-energy phosphate compounds, ATP as the universal energy currency; coupled reactions and standard reduction potentials. Glycolysis – all steps, enzymes, and energetics; regulation at PFK-1, hexokinase, and pyruvate

Title	Topics
	kinase; substrate-level phosphorylation. Pyruvate dehydrogenase complex – mechanism, cofactors, and regulation. TCA (Krebs) cycle – all reactions, stoichiometry, regulatory enzymes (isocitrate dehydrogenase, α-KG dehydrogenase), and anaplerotic reactions. Electron transport chain – Complexes I–IV; proton gradient generation; chemiosmotic theory (Mitchell hypothesis); ATP synthase (F0F1) rotary mechanism; inhibitors and uncouplers. Oxidative phosphorylation – P/O ratios; mitochondrial membrane potential. Gluconeogenesis – bypass reactions, regulatory enzymes; Cori cycle and glucose-alanine cycle; reciprocal regulation with glycolysis. Glycogen metabolism – glycogen synthase and phosphorylase; hormonal regulation (insulin and glucagon); glycogen storage diseases. Pentose phosphate pathway – oxidative and non-oxidative phases; NADPH generation; role in nucleotide biosynthesis and antioxidant defence. Fatty acid oxidation – activation, mitochondrial import via carnitine shuttle, β-oxidation steps and energetics; odd-chain and unsaturated fatty acid oxidation; ketogenesis and ketone body utilisation. Fatty acid synthesis – acetyl-CoA carboxylase, FAS complex, elongation, and desaturation; regulation. Amino acid catabolism – transamination, oxidative deamination, urea cycle, one-carbon metabolism; metabolism of individual amino acids. Integration of metabolism – hormonal regulation by insulin, glucagon, and cortisol; AMPK signalling; metabolic interorgan coordination among liver, muscle, brain, and adipose tissue.
Molecular Biology	DNA structure – B, A, and Z forms; supercoiling; chromatin organisation (nucleosome, histones, 30 nm fibre, higher-order compaction). DNA replication – prokaryotic (E. coli) and eukaryotic machinery; origins of replication and replicons; roles of helicase, primase, DNA polymerases (I, III in prokaryotes; α, δ, ε in eukaryotes), sliding clamps, SSB, topoisomerases I and II, and DNA ligase; leading and lagging strand synthesis; Okazaki fragments; telomere replication and telomerase mechanism. DNA repair – direct reversal by photolyase; base excision repair (BER); nucleotide excision repair (NER); mismatch repair (MMR); double-strand break repair by NHEJ and homologous recombination. Transcription – prokaryotic RNA polymerase holoenzyme; sigma factors; promoter elements (-10, -35); eukaryotic RNA polymerases I, II, and III and their promoters; general transcription factors (TFIID, TFIIB, TFIIH); transcription initiation, elongation, and termination (rho-dependent and rho-independent in prokaryotes; poly-A signal in eukaryotes). RNA processing – 5’ capping (7-methylguanosine); 3’ polyadenylation; pre-mRNA splicing and spliceosome assembly; alternative splicing; RNA editing; nuclear export. Translation – genetic code (properties: degeneracy, non-overlapping, universal); ribosome structure (30S+50S; 40S+60S); aminoacyl-tRNA synthetases and proofreading; initiator tRNA (fMet in prokaryotes, Met in eukaryotes); initiation, elongation (A-site decoding, peptidyl

Title	Topics
	transfer, translocation), and termination; ribosome recycling. Post-translational modifications – phosphorylation, glycosylation, ubiquitination, sumoylation, acetylation, and methylation; protein targeting (signal peptide, NLS, NES) and sorting. Gene regulation – lac operon and trp operon (prokaryotic); eukaryotic activators and repressors; enhancers and silencers; epigenetic regulation (DNA methylation at CpG, histone acetylation and methylation, chromatin remodelling complexes); non-coding RNAs (miRNA, siRNA, piRNA, lncRNA) and RNAi gene silencing pathway.
Cell Biology and Signal Transduction	Membrane structure and function – fluid mosaic model; lipid bilayer composition and dynamics; membrane asymmetry; lipid rafts; integral and peripheral membrane proteins. Membrane transport – passive and facilitated diffusion; primary active transport (Na+/K+-ATPase, Ca2+-ATPase, ABC transporters); secondary active transport (symport and antiport); aquaporins; ion channels and gating mechanisms (voltage-gated, ligand-gated). Vesicular transport – endocytosis (clathrin-mediated, caveolae), phagocytosis, macropinocytosis; exocytosis; SNARE hypothesis; lysosome biogenesis and autophagy; Golgi apparatus function and protein glycosylation. Signal transduction – G-protein coupled receptors (Gs, Gi, Gq) and cAMP, IP3/DAG second messenger pathways; protein kinase A and C; receptor tyrosine kinases and downstream Ras/Raf/MEK/ERK (MAPK) cascade; PI3K/Akt/mTOR pathway; JAK-STAT pathway; nuclear receptors and steroid hormone signalling. Second messengers – cAMP, cGMP, Ca2+/calmodulin, diacylglycerol, inositol 1,4,5-trisphosphate, and nitric oxide. Cell cycle – G0, G1, S, G2, and M phases; cyclin-CDK complexes (cyclin D-CDK4/6, cyclin E-CDK2, cyclin B-CDK1); CDK inhibitors (INK4, Cip/Kip families); Rb-E2F pathway; G1/S, intra-S, G2/M, and spindle assembly checkpoints; p53 as a guardian of the genome. Apoptosis – intrinsic (mitochondrial: Bcl-2 family, cytochrome c, apoptosome) and extrinsic (death receptor: FADD, caspase-8) pathways; executioner caspases; regulation by IAPs and p53. Cytoskeleton – actin filaments (polymerisation, treadmilling, myosin II in muscle contraction and cytokinesis); microtubules (dynamic instability, kinesin and dynein motor proteins, mitotic spindle formation); intermediate filaments and their tissue-specific expression.
Immunology and Biochemical Diseases	Structural biochemistry – thermodynamics of protein folding (hydrophobic effect, hydrogen bonds, van der Waals, disulfide bonds); molecular chaperones (HSP70, HSP90, GroEL/GroES); protein misfolding, aggregation, amyloid fibril formation, and prion diseases. Haemoglobin and myoglobin – oxygen-binding curves; cooperative oxygen binding; Bohr effect; 2,3-BPG effect; sickle cell anaemia (HbS) and thalassaemias. Innate and adaptive immunity – pattern recognition receptors (Toll-like receptors); innate effectors (NK cells, macrophages, complement). Antibody structure and function – immunoglobulin G domain organisation; Fab and Fc regions; VH and VL domains; CDRs; antibody classes (IgG, IgA, IgM,

Title	Topics
	IgE, IgD) and their effector functions. Antigen–antibody interactions – affinity, avidity, cross-reactivity, and specificity. Complement system – classical, alternative, and lectin activation pathways; membrane attack complex (MAC). Antigen presentation – MHC class I (endogenous pathway, CD8+ T cells) and MHC class II (exogenous pathway, CD4+ T cells); TCR recognition and T-cell activation; clonal selection and deletion. B-cell activation, class switching, somatic hypermutation, and affinity maturation. Cytokines – interleukins, interferons (type I and type II), TNF, and chemokines; roles in immune regulation. Biochemical basis of diseases – lysosomal storage disorders (Gaucher disease, Tay–Sachs disease, Pompe disease, Niemann–Pick disease); inborn errors of amino acid metabolism (PKU, alkaptonuria, homocystinuria, maple syrup urine disease); diabetes mellitus type 1 and type 2 (molecular mechanisms of insulin resistance and beta-cell failure); oncogenesis (proto-oncogenes, tumour suppressor genes, cell cycle dysregulation, Warburg effect); neurodegenerative diseases (Alzheimer's – amyloid and tau; Parkinson's – alpha-synuclein).
Biochemical Techniques	Nucleic acid techniques – PCR (standard, RT-PCR, quantitative real-time PCR, digital droplet PCR); Southern blotting, Northern blotting, and in situ hybridisation; DNA sequencing (Sanger method; next-generation sequencing – Illumina short-read, Nanopore long-read); CRISPR-Cas9 mechanism, PAM recognition, guide RNA design, and applications in genome editing. Protein techniques – SDS-PAGE, native PAGE, two-dimensional gel electrophoresis, and isoelectric focusing; Western blotting; ELISA (direct, indirect, sandwich, and competitive formats); immunoprecipitation and co-immunoprecipitation; yeast two-hybrid and pull-down assays. Spectroscopy and structural biology – UV-Vis spectrophotometry; fluorescence spectroscopy and FRET; circular dichroism (CD) for secondary structure analysis; X-ray crystallography (diffraction, phase problem, electron density maps); NMR spectroscopy (1H, 13C; NOE, COSY); cryo-electron microscopy (cryo-EM) and single-particle analysis; mass spectrometry (MALDI-TOF, ESI-MS/MS) for protein identification and proteomics. Chromatography – HPLC and FPLC; size exclusion (SEC), ion exchange (IEX), affinity, hydrophobic interaction (HIC), and reverse-phase chromatography; gas chromatography (GC) for volatile compounds. Centrifugation – differential centrifugation; sucrose density gradient and CsCl isopycnic centrifugation; analytical ultracentrifugation (sedimentation coefficient, molecular mass determination). Biophysical techniques – isothermal titration calorimetry (ITC) for binding thermodynamics; surface plasmon resonance (SPR) for binding kinetics; dynamic light scattering (DLS) for particle size; flow cytometry and fluorescence-activated cell sorting (FACS); confocal microscopy and super-resolution microscopy (STED, STORM). Radioisotope techniques – principles of radioactive labelling (32P, 35S, 14C, 3H); autoradiography; liquid scintillation counting; use of

Title	Topics
	radioisotopes in metabolic flux and pulse-chase studies.

Syllabus for Ph.D. Program – LAW

Program	:	Doctor of Philosophy
Name of the School	:	School of Law
Discipline	:	LAW
Code	:	LAW

Title	Topics
Constitutional Law	Preamble, Essential Features of Indian Constitution Fundamental Rights and Duties, Directive Principles of State Policy, Judiciary, Executive, Union State Legislative Relations, Emergency Provisions, Amendment of the Constitution, Writ Jurisdiction.
Legal theory and Jurisprudence	Nature and Sources of Law, Natural Law Theory, Positivistic approach, social logical approach, law and morality, theories of justice, Theories of Punishment, Rights and Duties, Concepts of Possession and Ownership; Different schools of Law- Critical analysis of Law.
Public international law	Nature of International Law and its relationship with Municipal Law, Sources of International Law, Recognition of States and Governments, United Nations, Settlement of International Disputes, Human Rights.
Law of Contracts	General Principles - Essentials of a valid contract, Offer, acceptance and consideration, Capacity to Contract—Minor's contract, Elements vitiating contract—mistake, fraud, misrepresentation, public policy, coercion, undue influence, frustration of contract, Remedies for breach of contract—Damages.
Law of Crimes	General Principles - Nature and Definition of Offence, General Exceptions, Common Intention and Common Object, Offences against human body, offences against property, Criminal Attempt, Conspiracy and Abetment, Offences against Women.
Human Rights	Concept and Development of Human Rights, Contribution of United Nations in the development and implementation of Human Rights, Implementation of Human Rights in India—Role of National Human Rights Commission, Protection of Marginalised Groups— Women, Children, Minorities and Refugees.
Environmental Law	Meaning of Environment and Environmental Pollution; Kinds of Pollution, Legislative Measures for Prevention and Control of Environmental Pollution in India—Air and Water Pollution and General Protection of Environment, International Development for protection of Environmental Pollution, Remedies for Environmental Protection—Civil, Criminal and Constitutional Importance of Forest and Wildlife in protecting environment, Environmental impact assessment and control of Hazardous wastes.

Syllabus for Ph.D. Program – COMMERCE

Program	:	Doctor of Philosophy
Name of the School	:	School of Arts & Science
Discipline	:	COMMERCE
Code	:	COMR

Title	Topics
Research Methodology	Meaning and objectives of research – Types of research (basic, applied, descriptive) – Research process and stages – Identification and formulation of research problem in commerce – Review of literature (basic understanding) – Hypothesis (meaning, types, and basic testing concepts) – Variables in research (independent and dependent) – Basic research design concepts – Sources of data (primary and secondary) – Methods of data collection (survey, observation, interview) – Basics of sampling techniques – Simple data analysis and interpretation – Research ethics – Plagiarism and academic integrity – Fundamental research aptitude (logical reasoning, analytical thinking, data interpretation)
Financial Accounting	Accounting principles and concepts – Accounting standards (overview of Ind AS/IFRS) – Accounting cycle (journal, ledger, trial balance) – Subsidiary books – Rectification of errors – Depreciation accounting (straight line and written down value methods) – Accounting for bills of exchange – Bank reconciliation statement – Preparation of final accounts of sole proprietorship concerns – Cash flow statements (basic concepts) – Ratio analysis (liquidity, profitability, turnover, solvency ratios) – Interpretation of financial statements for decision-making
Corporate Accounting	Accounting for share capital (issue, forfeiture, reissue) – Accounting for debentures (issue, redemption, interest) – Final accounts of companies – Managerial remuneration – Valuation of goodwill and shares – Amalgamation, absorption, and reconstruction of companies – Internal reconstruction – Consolidated financial statements (holding and subsidiary companies) – Accounting for mergers and acquisitions – Corporate financial reporting practices – Disclosure requirements and transparency
Cost Accounting	Cost concepts and classification – Elements of cost (material, labour, overheads) – Inventory control techniques (EOQ, stock levels, ABC analysis) – Preparation of cost sheet – Methods of costing (job costing, batch costing, process costing, contract costing) – Marginal costing and managerial decision-making – Cost-volume-profit analysis – Budgetary control (functional budgets, flexible budgets, master budget) – Standard costing and variance analysis (material,

Title	Topics
	labour, overhead variances) – Cost control and cost reduction techniques
Management Accounting and Financial Management	Management accounting concepts and scope – Financial statement analysis (comparative statements, common size statements) – Fund flow and cash flow analysis – Budgeting and forecasting techniques – Time value of money (discounting and compounding) – Capital budgeting techniques (NPV, IRR, ARR, Payback Period) – Cost of capital (specific and weighted average) – Capital structure theories (NI, NOI, MM approach) – Leverage analysis (operating, financial, combined) – Dividend policy theories – Working capital management – Risk-return analysis – Financial decision-making in business organizations
Business Economics	Demand and supply analysis – Elasticity of demand – Consumer behavior theories (cardinal utility, ordinal utility, indifference curve analysis) – Production function and laws of returns – Cost and revenue analysis – Market structures (perfect competition, monopoly, monopolistic competition, oligopoly) – Pricing strategies and practices – National income concepts and measurement – Inflation, deflation, and unemployment – Monetary policy and fiscal policy – Indian economic environment – Economic reforms, liberalization, privatization, globalization – Role of government in business – Economic analysis for managerial decisions
Business Laws and Corporate Governance	Indian Contract Act, 1872 (offer, acceptance, consideration, breach of contract) – Sale of Goods Act – Companies Act, 2013 (incorporation, management, meetings, winding up) – Partnership Act, 1932 and Limited Liability Partnership – Negotiable Instruments Act – Consumer Protection Act – FEMA basics – Competition law – Corporate governance principles – SEBI regulations – Business ethics and corporate social responsibility – Legal compliance and corporate accountability
Marketing Management	Marketing concepts and evolution – Marketing environment analysis (micro and macro) – Consumer behavior and buying decision process – Market segmentation, targeting, and positioning (STP) – Product life cycle and product strategies – Pricing strategies and methods – Promotion mix (advertising, sales promotion, personal selling, public relations) – Distribution channels and logistics – Branding, packaging, and labeling – Services marketing – Digital marketing (SEO, social media, e-commerce platforms) – Marketing analytics – Customer relationship management (CRM)
Human Resource Management and Organizational	Human resource planning – Recruitment, selection, and placement – Training and development – Performance appraisal methods – Compensation and reward management – Motivation theories

Title	Topics
Behavior	(Maslow, Herzberg, McGregor) – Leadership theories and styles – Organizational behavior concepts – Group dynamics and teamwork – Industrial relations – Trade unions – Conflict and grievance management – Organizational culture and change – HR analytics and strategic HRM
Strategic Management, Entrepreneurship and Emerging Trends in Commerce	Strategic management concepts and process – Environmental analysis (SWOT, PESTLE, Porter's Five Forces) – Competitive strategies (cost leadership, differentiation, focus) – Corporate governance and ethics – Business policy formulation and implementation – Entrepreneurship development – Startup ecosystem and innovation – MSMEs and government initiatives (Startup India, Make in India) – Financial inclusion and inclusive growth – Sustainability accounting and ESG practices – Digital economy and FinTech – E-commerce and digital transformation – Artificial Intelligence and data analytics in business – Contemporary issues in commerce and global business environment

Syllabus for Ph.D. Program – TAMIL

Program	:	Doctor of Philosophy
Name of the School	:	School of Arts & Science
Discipline	:	TAMIL
Code	:	TAM

தலைப்பு	பிரிவு
ஆய்வு முறை	ஆய்வு சொற்பொருள் விளக்கம் - ஆய்வு வகைகள் - தரநிலை ஆய்வு - பயன்பாட்டு முறை ஆய்வு -ஒரு துறை ஆய்வும் தொடர்புடைய பல்துறை சார் ஆய்வும் - பகுப்பு முறை ஆய்வு - தொகுப்பு முறை ஆய்வு - கள ஆய்வு - வரலாற்று முறை ஆய்வு - சமூகவியல் அணுகுமுறை ஆய்வு -உளவியல் அணுகுமுறை ஆய்வு -அறிவியல் அணுகுமுறை ஆய்வு - ஒப்பியலாய்வு
ஆய்வுச்சிக்கல்கள்	ஆய்வுச்சிக்கல்கள் - ஆய்வுச் சிக்கல்களை இனம் காணுதலும் பகுத்து உணர்தலும் - ஆய்வுச் சிக்கலை மையமிட்ட தலைப்பினைத் தெரிந்தெடுத்தல் - வரையறுத்தல் எல்லை சுட்டல் -கருதுகோள் -அதன் இலக்கணம் -ஆய்வில் கருதுகோள் - பெறும் இடம் -அதன் வகைபாடுகள் - களப்பணி -பல்வேறு முறைகள் - வினா நிரல் -நேர்காணல் - வகைகள் காணும் முறையும் நாகரீகமும்
ஆராய்ச்சிகள்	சங்க இலக்கிய ஆராய்ச்சிகள் - இலக்கண ஆராய்ச்சிகள் - காப்பிய ஆராய்ச்சிகள் - பக்தி இலக்கிய ஆராய்ச்சிகள் - இக்கால இலக்கிய ஆராய்ச்சிகள் - உளவியல் ஆராய்ச்சிகள்
ஆய்வுத் தரவுகளைத் திரட்டுதல்	ஆய்வுத் தரவுகளைத் திரட்டுதல் - முதன்மை ஆதாரங்கள் -துணைமை ஆதாரங்கள் - நூலகப் பயன்பாடு - ஆய்வு நடை - ஆய்வுத் தரவுகளைத் திரட்டுதல் - முதன்மை ஆதாரங்கள் -துணைமை ஆதாரங்கள் - நூலகப் பயன்பாடு - ஆய்வு நடை -

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