

NIFTEM Research Entrance Test

(RET)-2020

Syllabus Booklet

NIFTEM RET-2020 Syllabus

Important information regarding RET

- **Pattern of RET**

The RET is to be conducted as single test.

Test will contain Research Methodology - 35 Questions (For all departments)

Subject specific Questions - 35 Questions. (to be chosen by candidate)

It will be a single test of 90 minutes.

Each question will carry one mark,

There will be no negative marking

- **Interview**

The selected candidates will be required to appear in interview. The candidate will have to present his/her proposed research plan.

- **Venue of RET and Interview**

The RET and interview will be conducted at NIFTEM campus centre only. In case of prevailing nCovid 19 conditions, the test may be organised either or both offline or online. The information will be displayed on website. Candidates must visit NIFTEM website regularly for updates.

NIFTEM RET-2020 Syllabus

Subject: Research Methodology

I. Research Aptitude

Research: Meaning, characteristics and types; Steps of research; Methods of research; Research Ethics; Research problem, Meaning of research problem, Sources of research problem, Characteristic of a good research problem. Hypothesis: meaning of hypothesis, Research proposal or synopsis

II. Reasoning (Including Mathematical)

Number series; letter series; codes; Relationships; classification.

III. Logical Reasoning

Understanding the structure of arguments; Evaluating and distinguishing deductive and inductive reasoning; Verbal analogies: Word analogy — Applied analogy; Verbal classification. Reasoning Logical Diagrams: Simple diagrammatic relationship, multidigraphmatic relationship; Venn diagram; Analytical Reasoning.

IV. Information and Communicating Technology (ICT)

ICT : meaning, advantages, disadvantages and uses; General abbreviations and terminology; Basics of internet and e-mailing, Microsoft office 2007 and 2010.

V. Reading Comprehension and General Knowledge

A passage to be set with questions to be answered, General knowledge and Current affairs (Related to science, engineering and technology).

NIFTEM RET-2020 Syllabus

AGRICULTURE & ENVIRONMENTAL SCIENCES DEPARTMENT

Subject: Agriculture and Environmental Sciences

Unit 1: General Agriculture: Importance of Agriculture in national economy; Agro climatic zones; Industrial and export potential; Agri Export Zones (AEZ) and industrial supports. Basic principles of crop production; cultivation of rice, wheat, tomato, onion and potato. Major soils of India, role of NPK and their deficiency symptoms.

Unit 2: Post-Harvest Technology of Vegetable Crops: Scope and importance of post-harvest management of vegetables; Nature and causes of post harvest losses; Maturity indices and standards for different vegetables; methods of assessment of maturity, physiological and biochemical changes during maturity and ripening, enzymatic and textural changes, ethylene evolution and ethylene management, respiration, transpiration, regulation methods; Influence of pre-harvest practices and other factors affecting shelf life and post-harvest quality; Harvesting methods, tools, harvesting practices for specific market requirements; pre cooling methods; grading, washing, pack house operations, pre treatments chemicals, wax coating, edible coating, pre packaging and irradiation; packaging of vegetables, packaging materials; Storage methods - ventilated, refrigerated, MA, CA storage, hypobaric storage, cold storage, zero energy cool chamber; Storage disorders –chilling and freezing injury in vegetables.

Unit 3: Post-Harvest Technology of Fruit Crops: Scope and importance of post-harvest management of fruits; Factors leading to post-harvest losses; Maturity indices, methods of assessment of maturity, harvesting practices and grading for specific market requirements; Physiological and biochemical changes during maturity and ripening, ethylene evolution and ethylene management; enzymatic and textural changes, respiration, transpiration; Influence of pre-harvest practices and other factors affecting shelf life and post-harvest quality; Harvesting methods, tools, harvesting practices for specific market requirements; Pre cooling methods; grading, washing, pack house operations, pre treatments treatment prior to shipment, viz., chlorination, waxing, chemicals, bio-control agents and natural plant products, fungicides, hot water, vapour heat treatment, sulphur fumigation and irradiation; Pre packaging and irradiation, packaging of fruits. Principles and methods of preservation, food processing, canning, fruit juices, beverages, pickles, jam, jellies, candies; Dried and dehydrated products, packaging technology, processing waste management.

UNIT 4: Environmental Sciences: Ecological Concepts and Principles; Ecosystem- types; trophic structure, food chain, food web, ecosystem function; Threats to biodiversity and conservation approaches; Concept of sustainability and sustainable development; Environmental pollution and remedies.

Unit 5: Analytical techniques:, principles and applications of spectroscopy- UV, visible and fluorescence; Chromatography: Basic principles, paper and thin layer chromatography; Gel permeation, ion exchange, hydrophobic, reverse phase and affinity chromatography; HPLC

NIFTEM RET-2020 Syllabus

and FPLC; Theory and applications of electrophoresis-Agarose and polyacrylamide gels, capillary, 2D gel electrophoresis.

Unit 6: Role of microorganisms in production of fermented foods and beverages; storage and packaging; food ingredients and additives prepared by fermentation; alcoholic beverages and other products; process wastes-whey, molasses, starch substrates and other food wastes for bioconversion to useful products; bacteriocins from lactic acid bacteria – production and applications in food preservation.

NIFTEM RET-2020 Syllabus

BASIC AND APPLIED SCIENCES DEPARTMENT

Subject: Biochemistry, Microbiology and Biotechnology

Biochemistry

Structure of atoms and molecules, Chemical bonding in biological systems, pH and buffers, Structure, function and metabolism of carbohydrates, lipids and proteins; Major classes of enzymes, general properties, kinetics. Isolation, purification and measurement of enzyme activity. Enzyme units. Enzyme engineering. Role of enzymes in agriculture, industry, and medicine. Spectrophotometry, UV and VIS, fluorimetry, turbidometry and atomic absorption spectrophotometry. gel electrophoresis, isoelectric focusing, pulsed field gel electrophoresis, immunoelectrophoresis. Chromatographic techniques - paper, thin layer, column chromatography, GC and HPLC. Centrifugation - principles of sedimentation in various rotors, differential centrifugation, density gradient centrifugation and ultracentrifugation.

Microbiology

Morphological, natural, physiological, spoilage and pathogenic characteristics of commonly occurring microbes in food and food products; Newer approaches for classification of microorganisms; Methods of sterilization and disinfection; Isolation and preservation of different types of microorganisms; Industrial production of metabolites - organic acids, alcohols, antibiotics. Fermentor designs and types. Control of fermentation process - batch, feed batch and continuous. Downstream processing in fermentation industry. Production of single cell proteins and probiotics, hormones, biofertilizers, biopesticides. Microbial assay of vitamins, enzymes and antibiotics. Microbiology of raw and processed foods. Fermented food - vinegar, wine sauerkraut, pickles, cheese, yogurt. Food preservation, contamination and spoilage, food-borne illness and intoxication. Food as substrate for micro-organism, microflora of meat, fish, egg, fruits, vegetables, juices, flour, canned foods; bio-degrading microbes, single cell protein for use as food and feed, bioactive food / probiotics

Biotechnology

History and development of biotechnology; Application of biotechnology to food production; Methods of molecular cloning; PCR and application of RFLP, RAPD, AFLP, microsatellite and mitochondrial and ribotyping techniques. Southern, Northern and Western blotting, ELISA. Microarray and DNA chips; immobilization of microbial and cultured plant cells; Plant tissue culture; Regulatory and social aspects of biotechnology of foods; Genetically modified foods (GMF); Production of food flavour, colour. polysaccharides, amino acids, vitamins, baker's yeast, brewer's yeast and single cell protein; Bioinformatics- introduction, databases-protein and nucleic acid, sequence analysis, structural databases, genomics and proteomics, molecular structure and modeling of biomolecules.

NIFTEM RET-2020 Syllabus

BASIC AND APPLIED SCIENCES DEPARTMENT

Subject: Chemistry

Physical Chemistry: Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance. Electrochemistry: Nernst equation, redox systems, electrochemical cells; Debye-Huckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations. Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions. Colloids and surfaces: Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis. Polymer chemistry: Molar masses; kinetics of polymerization.

Organic Chemistry: Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways. Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.

Inorganic Chemistry: Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.

Analytical Chemistry- separation, spectroscopic, electro- and thermoanalytical methods, Principles of optical, fluorescence and electron microscopy, spectrophotometry, UV and VIS, fluorimetry, turbidometry and atomic absorption spectrophotometry. Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques. Structure determination of organic compounds by IR, UV-Vis, ^1H & ^{13}C NMR and Mass spectroscopic techniques.

Radioisotopic techniques – scintillation counters and autoradiography and their application in biological sciences. Chromatographic techniques - paper, thin layer, column chromatography, GC and HPLC.

NIFTEM RET-2020 Syllabus

BASIC AND APPLIED SCIENCES DEPARTMENT

Subject: Analytical Chemistry, Food Safety & Public Health

Unit- 1

Use of analytical techniques for food analysis : General principles, components of instrumentation and applications: Chromatography (GC, GC-MS, LC, LC-MS, TLC, HPTLC, Ion- chromatography, Gel Permeation chromatography); Spectroscopy (Molecular and Atomic: IR, FT-IR, UV-Visible, Atomic absorption, Atomic Emission, Fluorescence), Thermal methods (TGA and DSC), Refractometer and polarimeter; Rheology of food products, Water activity and Moisture analysis.

Unit- 2

Carbohydrates: Monosaccharide, Disaccharides, Oligosaccharides, Polysaccharides. Chemical reaction with acids, alkali, oxidation-reductions, amines. Modified food starch systems. Polysaccharides: amylose, amylopectin, starch, gums, seaweed polysaccharides, cellulose, hemicellulose. Dietary fibre and carbohydrate digestibility; **Vitamins**: Structure and general properties, stability and modes of degradation, bioavailability; **Enzymes** : Enzymes endogenous to foods and their control- Enzyme activities related to color, flavor and textural quality of food; **Proteins**: Structural and functional properties of proteins, nutrition and anti-nutritional factors in proteins, Physicochemical properties of amino acids, processing induced physical, chemical and nutritional changes in proteins. **Lipids**: Physicochemical properties and classification of lipids, saturated and unsaturated fatty acids, phospholipids, sphingolipids,. Chemical deterioration of lipids: Hydrolytic and oxidative reactions, Lipid oxidation, Lipid processing: refining, neutralisation, bleaching, deodorization, blending, hydrogenation, etc. Quality parameters of oils and fats: significance and determination, Sterols, Cholesterol, Antioxidants, Steroids, Glycosides Alkaloids, Flavonoids

Unit- 3

General principles of toxicology (Dose response, LC₅₀, LD₅₀, ADI, TDO, MRL values), Safe food, Safety and Quality of food, Contaminant and adulterants in Food, Classification of contaminants: Physical, Chemical and Biological, Sources of various contaminants, Food Safety issues from food processing and food packaging, Food additives: preservatives, antioxidants, artificial sweeteners, colouring agents, flavouring agents and flavour enhancers, Basics of Food Safety Quality systems, general principles of HACCP.

Unit- 4

Micro-organisms in natural food products and their control. Microbial contamination in different categories of food products: vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing.

Unit- 5

NIFTEM RET-2020 Syllabus

Sources of food and their classification- plant foods, animal foods, sea foods. Types of preservatives, advantages, mechanism and techniques of food preservations: thermal/heat processing(microwave, dielectric), chilling, freezing, chemical, fermentation, irradiation, different types of packaging for food products, smart and active packaging materials, food packaging interactions, Application of nanotechnology to food sciences.

Unit- 6

General and basics about Nutraceuticals and functional foods, GM foods.

NIFTEM RET-2020 Syllabus

BASIC AND APPLIED SCIENCES DEPARTMENT

Subject: Basic Mathematics and Statistics

UNIT-1

Matrices and Determinants, Limit, continuity and differentiability; Ordinary Differential Equations (odes): Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. Partial Differential Equations (PDEs): First order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations. Mathematical modeling: Enzyme and microbial kinetic models (growth and decay/inactivation kinetics), Heat, Mass transfer and momentum equations and solutions. Numerical Analysis: Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.

UNIT-2

Borel-contelli Lemma, Tchebycheff's and Kolmogorov's inequalities, Various modes of convergence: in probability, almost sure, in distribution and in mean square and their interrelationship. Properties of a good estimator, Concept of likelihood function, Cramer-Rao inequality, Bhattacharya Bounds, Minimum mean square estimation, Rao-Black well theorem.

UNIT-3

Descriptive Statistics, exploratory data analysis.

Binomial, Poisson, Geometric, Normal, Exponential, Beta and Gamma distributions. Sampling distributions; Student-t distribution, F-distribution and Chi-square distribution. Simple tests based on t, f, Chi-square and normal variate z.

Probability sampling. Sampling with equal and unequal probabilities :pps sampling with replacement and without replacement sampling. Stratified sampling. Proportional allocation, optimum allocation. Basic principles of experimental design. Construction and analysis of completely randomized, randomized blocks and Latin-square designs. Factorial experiments: symmetrical factorials. Factorial experiment with each factor at two levels

NIFTEM RET-2020 Syllabus

UNIT-4

Correlation and Regression, Multiple correlation and regression, Sampling and Design of Experiments: Random Sampling methods, RBD, CRD, LSD , Linear Programming : simplex method, Methods of findings BFS for the transportation problems, Infrence : Testing of hypothesis , simple against simple, properties of good estimators, Time Series: Methods of measuring : linear trend , seasonal variations, Vital Statistics: Measures of fertility and Mortality, Queues and Stochastic Processes : Basics of queues : Markovchain ; Markov Process

Multivariate Normal distribution Marginal and Conditional distributions. Estimation of the mean vector and covariance matrix, maximum likelihood estimator of the parameters of multivariate normal distribution. The distribution of the sample mean vector and sample dispersion matrix. Hotteling's T^2 and Mahalanobis- D^2 Statistic; distribution and uses. Principal components and Canonical correlation in the population.

NIFTEM RET-2020 Syllabus

BASIC AND APPLIED SCIENCES DEPARTMENT

Subject: Physics and Material Science

1. Mathematical methods of Physics:

Vector spaces and matrices: linear independence, bases, dimensionality, matrices, inverse, orthogonal and unitary matrices, eigenvalues and eigenvectors, diagonalization, complete orthonormal sets of functions, Taylor and Laurent series, evaluation of real definite integrals. Legendre, Bessel, Hermite and Laguerre equations, Generating functions and recurrence relations, Integral transforms, Laplace transform (LT), Fourier series (FS), FS of arbitrary period, Fourier integral and transforms; Elementary properties of group theory; Data interpretation and analysis, Precision and accuracy, error analysis, propagation of errors, least squares fitting, linear and nonlinear curve fitting, chi-square test;

2. Spectroscopy & Instrumentation Techniques:

Quantum states atom, electron spin, spectrum of helium and alkali atom, relativistic corrections for energy levels of hydrogen atom, hyperfine structure and isotopic shift, width of spectrum lines, L-S & J-J couplings, Zeeman, Paschen-Bach & Stark effects. Electron spin resonance, Nuclear magnetic resonance, Frank-Condon principle. Electronic, rotational, vibrational and Raman spectra, selection rules. Lasers: spontaneous and stimulated emission, Einstein coefficients, LASER characteristics and fundamentals, resonator, He-Ne, CO₂ and Semiconductor lasers. Reflection, absorption, emission, scattering in spectroscopy, basics of UV-Vis, FTIR, XRD, SEM, TEM, AFM techniques.

3. Electromagnetism & optics:

Electrostatics and magnetostatics, boundary value problems, fields in conducting, dielectric, frequency dependent polarization, dielectric loss, Faraday's law and time varying fields; displacement current; Maxwell's equations; energy and momentum of electromagnetic fields; propagation of plane electromagnetic waves, reflection, refraction; electromagnetic waves in dispersive and conducting media; light diffraction, interference and polarization, refractive index and dielectric permittivity relations, Fibre optics materials, types, dispersion and attenuation in optical fibers,

4. Thermodynamics & statistical physics:

Laws of thermodynamics, work and heat, thermodynamic potentials; Elements of kinetic theory; Maxwell's relations; statistical ensembles; partition function; Free Energy and connection with thermodynamic quantities; First- and second-order phase transitions; classical and quantum statistics;

5. Quantum mechanics:

Wave-particle duality, de Broglie's wavelength, uncertainty principle, Bohr atom, Schrödinger wave equation (time-dependent and time-independent), stationary states and energy spectra, particle in a square well potential, potential barrier tunnelling, quantum

NIFTEM RET-2020 Syllabus

operators; position, momentum, energy and parity, linear and angular momentum, linear harmonic oscillator, eigenvalue problems (particle in a box, harmonic oscillator, etc.). Dirac notation for state vectors, time-independent perturbation theory and applications, molecular orbitals of the homo and heteronuclear diatomic molecules, chemical bond, bonding and anti-bonding regions-formation of bonds,

6. Condensed Matter Physics:

Free electron theory of metals, band theory of solids, Bloch theorem, Kroning-Penne model, electric transport properties, mobility, resistivity, relaxation time, crystal defects, Band structures, Brillouin zones, effective mass, Hall Effect and thermoelectric power. Electronic, optical and magnetic properties of materials, photoconductivity, photoluminescence, fluorescence, electroluminescence. Magnetic materials, dia, para and ferromagnetism, ferrimagnetism, anti-ferromagnetism, smart and functional materials, structure and properties. Superconductivity, London Equation and Josephson effect, SQUIDS.

7. Nanomaterials:

Crystal structure, cohesive energy, surface energy, size effects on structure and morphology of nanoparticles, metallic, polymer and semiconductor Nano particles, types of nanostructures, properties, synthesis and applications, carbon nanotubes (CNTs), functional aspects, synthesis, characterization methods, applications in biotechnology.

8. Electronics and Experimental Techniques

Basics of semiconductor; p-n junctions, diodes, transistors; biasing, LCR circuits, basics of OPAMPs and their applications; basics of digital electronics, including generators and detectors; transducers (temperature, pressure/vacuum, magnetic field, vibration, optical, and particle detectors), measurement and control; Signal conditioning and recovery, impedance matching, rectifiers, amplification (op-amp based, feedback), oscillators, filtering and noise reduction, Fourier transforms; lock-in detector, basics of lithography techniques, CMOS, microprocessor and microcontroller basics.

NIFTEM RET-2020 Syllabus

FOOD BUSINESS MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT DEPARTMENT

Subject: Food Business Management and Entrepreneurship

I. Agri and Food business Management

Principles of Agri and Food Business Management ,Rural Markets and services, Agricultural Innovation, Financial Management in Agriculture, Importance of Agriculture business,Agricultural Policy: Instruments of policy, phases in agricultural policy. MSP, PDS. APMC, e-NAM, Globalization, WTO and Agriculture, SAMPADA, Meaning, Scope & importance of managerial Economics, Sustainable Agriculture, Agro Processing Industry.

II. Decision Sciences and Operations Management

Operation Research – Linear Programming, Introduction to Operations Research and models, Transportation and assignment problems, Queuing Theory, PERT / CPM, replacement Theory, Decision Theory

Operations Management – Role and Scope Facility Location and Layout – Site Selection and Analysis, Layout – Design and Process Enterprise Resource Planning – ERP Modules, ERP implementation Scheduling; Loading, Sequencing and Monitoring Quality Management and Statistical Quality Control, Quality Circles, Total Quality Management – KAIZEN, Benchmarking, Six Sigma; ISO 9000 Series Standards

III. Entrepreneurship and Strategy

Entrepreneurship Development – Concept, Types, Theories and Process, Developing Entrepreneurial Competencies Intrapreneurship – Concept and Process Women Entrepreneurship and Rural Entrepreneurship Innovations in Business – Types of Innovations, Creating and Identifying Opportunities, Screening of Business Ideas Business Plan and Feasibility Analysis – Concept and Process of Technical, Market and Financial Analysis Micro and Small Scale Industries in India; Role of Government in Promoting SSI Sickness in Small Industries – Reasons and Rehabilitation Institutional Finance to Small Industries – Financial Institutions, Commercial Banks, Cooperative Banks, Micro Finance.

Strategic Management – Concept, Process, Decision & Types Strategic Analysis – External Analysis, PEST, Porter’s Approach to industry analysis, Internal Analysis – Resource Based Approach, Value Chain Analysis Strategy Formulation – SWOT Analysis, Corporate Strategy – Growth, Stability, Retrenchment, Integration and Diversification, Business Portfolio Analysis - BCG, GE Business Model, Ansoff’s Product Market Growth Matrix Strategy Implementation – Challenges of Change, Developing Programs Mckinsey 7s Framework.

IV. Finance and Accounting

NIFTEM RET-2020 Syllabus

Accounting Principles and Standards, Preparation of Financial Statements Financial Statement Analysis – Ratio Analysis, Funds Flow and Cash Flow Analysis, DuPont Analysis Preparation of Cost Sheet, Marginal Costing, Cost Volume Profit Analysis Standard Costing & Variance Analysis Financial Management, Concept & Functions Capital Structure – Theories, Cost of Capital, Sources and Finance Budgeting and Budgetary Control, Types and Process, Zero base Budgeting Leverages – Operating, Financial and Combined Leverages, EBIT–EPS Analysis, Financial Breakeven Point & Indifference Level.

Value & Returns – Time Preference for Money, Valuation of Bonds and Shares, Risk and Returns; Capital Budgeting – Nature of Investment, Evaluation, Comparison of Methods; Risk and Uncertainly Analysis Dividend – Theories and Determination Mergers and Acquisition – Corporate Restructuring, Value Creation, Merger Negotiations, Leveraged Buyouts, Takeover Portfolio Management – CAPM, APT Derivatives – Options, Option Payoffs, Option Pricing, Forward Contracts & Future Contracts Working Capital Management – Determinants, Cash, Inventory, Receivables and Payables Management, Factoring International Financial Management, Foreign exchange market

V. Marketing

Marketing – Concept, Orientation, Trends and Tasks, Customer Value and Satisfaction Market Segmentation, Positioning and Targeting Product and Pricing Decision – Product Mix, Product Life Cycle, New Product development, Pricing – Types and Strategies Place and promotion decision – Marketing channels and value networks, VMS, IMC, Advertising and Sales promotion

Consumer and Industrial Buying Behaviour: Theories and Models of Consumer Behaviour Brand Management – Role of Brands, Brand Equity, Equity Models, Developing a Branding Strategy; Brand Name Decisions, Brand Extensions and Loyalty Logistics and Supply Chain Management, Drivers, Value creation, Supply Chain Design, Designing and Managing Sales Force, Personal Selling Service Marketing – Managing Service Quality and Brands, Marketing Strategies of Service Firms Customer Relationship Marketing – Relationship Building, Strategies, Values and Process Retail Marketing – Recent Trends in India, Types of Retail Outlets. Emerging Trends in Marketing – Concept of e-Marketing, Direct Marketing, Digital Marketing and Green Marketing International Marketing – Entry Mode Decisions, Planning Marketing Mix for International Markets.

VI. Organisational Behaviour & Human Resource Management

Organizational Behavior – Significance & Theories Individual Behaviour – Personality, Perception, Values, Attitude, Learning and Motivation Group Behaviour – Team Building, Leadership, Group Dynamics Interpersonal Behaviour & Transactional Analysis Organizational Culture & Climate Work Force Diversity & Cross Culture Organisational Behaviour Emotions and Stress Management Organisational Justice and Whistle Blowing Human Resource Management – Concept, Perspectives, Influences and Recent Trends Human Resource Planning, Recruitment and Selection, Induction, Training and Development Job Analysis, Job Evaluation and Compensation Management Organisational Behaviour –

NIFTEM RET-2020 Syllabus

Significance & Theories Individual Behaviour – Personality, Perception, Values, Attitude, Learning and Motivation Group Behaviour – Team Building, Leadership, Group Dynamics Interpersonal Behaviour & Transactional Analysis Organizational Culture & Climate Work Force Diversity & Cross Culture Organisational Behaviour Emotions and Stress Management Organisational Justice and Whistle Blowing Human Resource Management – Concept, Perspectives, Influences and Recent Trends Human Resource Planning, Recruitment and Selection, Induction, Training and Development Job Analysis, Job Evaluation and Compensation Management.

Strategic Role of Human Resource Management Competency Mapping & Balanced Scoreboard Career Planning and Development Performance Management and Appraisal Organization Development, Change & OD Interventions Talent Management & Skill Development Employee Engagement & Work Life Balance Industrial Relations: Disputes & Grievance Management, Labour Welfare and Social Security Trade Union & Collective Bargaining International Human Resource Management – HR Challenge of International Business Green HRM.

NIFTEM RET-2020 Syllabus

FOOD ENGINEERING DEPARTMENT

Subject: Food Engineering

Unit 1: Engineering Properties and Quality of Biomaterials

Physical and Engineering properties of agro produce (i.e. shape, size, volume, density, porosity, surface areas, friction, rolling resistance, angle of repose etc). Properties of bulk particulate solids (i.e. specific surface area, mean diameter, flow rate, Aerodynamics drag coefficient and terminal velocity, pressure drop through packed beds etc). Thermal properties (i.e. specific heat, thermal conductivity, thermal diffusivity. Dielectric properties viz. dielectric and microwave radiation, dielectric constant, energy absorption, heating etc). Optical properties and transmittance and reflectance. Rheological properties and stress-strain-time relationship.

Unit 2: Heat and Mass Transfer

Fluid transfer & continuity equation, Newtonian and non newtonian fluids, velocity, flow rate, pressure drop etc. Basic laws of thermodynamics, thermodynamic properties and processes, energy equations, heat, work, heat engine, heat pump, refrigeration and Steam generation and use of Steam tables for determination of quality of steam . EMC, sorption and desorption isotherms, water activity and psychrometry. Heat transfer and heat exchanger. Mass transfer and mass-heat-momentum transfer analogies.

Unit 3: Post Harvest Unit Operations

Unit operations i.e. cleaning, washing, grading, sorting, shelling, dehusking, decortication, milling, polishing, pearling, drying , pasteurization and sterilization of liquid foods, kinetics of microbial growth , size reduction, cryogenic grinding, granulation, crystallization, filtration, membrane processing, microfiltration, ultra-filtration, nano-filtration, reverse osmosis, evaporation, distillation, mixing, clarification, coagulation, mechanical separation, sedimentation, pressing, expelling, leaching, extraction, , extrusion, fermentation,

Unit 4: Material Handling, Packaging and Transport

Bulk conveying equipments viz. belt conveyors, screw/auger conveyors, bucket elevators and drag/chain conveyors. Estimation of energy requirement, damage to products during mechanical handling. Packaging material characteristics and selection. Packaging techniques Recent trends in packaging: aseptic, Modified atmosphere packaging, controlled atmosphere packaging, Nano-composite packaging, Smart and active packaging, Edible films, Antioxidant and anti microbial packaging.

Transportation of food by bullocks, trailers, trucks, rail wagons and containers. Refrigerated containers and trucks for perishable foods. Safety standards in handling, packaging and transport of agricultural produce.

NIFTEM RET-2020 Syllabus

Unit 5: Design of Processing Machinery

Design considerations of grain cleaners, graders, dryers, parboiling plants, size reduction machines, fermenters, centrifuges, cyclones, heat-exchangers, evaporators, filters, extrusion cookers etc

Unit 6: Novel Food processing techniques

High pressure processing, Pulsed electric field, Pulsed UV light, Ultrasonication ,Ohmic heating, Irradiation, Hurdle technology.

NIFTEM RET-2020 Syllabus

FOOD SCIENCE AND TECHNOLOGY DEPARTMENT

Subject: Food Science and Technology

Food Science: Carbohydrates, Proteins, Lipids, Pigments, Food flavours, Enzymatic and non-enzymatic browning; Nutrition: Balanced diet, Essential amino acids and fatty acids, PER, Water soluble and fat soluble vitamins, Role of minerals in nutrition, Antinutrients, Nutritional disorders, deficiency diseases, General Characteristics of microorganisms, Microbial growth in food: Intrinsic and extrinsic factors, Growth and death kinetics, serial dilution method for quantification; Microbial Food spoilage, Food borne illness Food Fermentation.

Food Products Technology: Processing principles: Canning, chilling, freezing, dehydration, control of water activity, CA and MA storage, fermentation, hurdle technology, addition of preservatives and food additives, Food packaging, cleaning in place and food laws.; Grain products processing: Milling of rice, wheat, and maize, parboiling of paddy, production of bread, biscuits, extruded products and breakfast cereals, Solvent extraction, refining and hydrogenation of oil; Fruits, vegetables and plantation products processing: Extraction, clarification concentration and packaging of fruit juice, Production of jam, jelly, marmalade, squash, candies, and pickles, pectin from fruit waste, tea, coffee, chocolate and essential oils from spices; Milk and milk products processing: Pasteurized and sterilized milk, cream, butter, ghee, ice-cream, cheese and milk powder; Animal products processing: Drying and canning of fish, post mortem changes, tenderization and freezing of meat, egg powder. Basic food engineering - Heat transfer: Heat transfer by conduction, convection, radiation, boiling and condensation, Unsteady state heat transfer in simple geometry, NTU- effectiveness relationship of co-current and counter current double pipe heat exchanger; Thermal operations: Energy requirement and rate of operations involved in process time evaluation in batch and continuous sterilization, evaporation of liquid foods, hot air drying of solids, spray and freeze-drying, freezing and crystallization; Mass transfer operations: Properties of air-water vapour mixture; Humidification and dehumidification operations.

Food toxicology, safety and nutraceuticals: Risk Analysis framework (Risk assessment, Management, Communication); LD₅₀, Acute, Subacute, subchronic and Chronic toxicity; Adverse Reactions to Food or Food Ingredients: Food Allergy, Food Toxicity (Poisoning); Common food adulterants, their toxicity & Detection; Toxicants derived from plants, Marine toxins, Microbial toxins and Mycotoxins, Carcinogens and toxicants generated during food processing and packaging; Food additives toxicity, Regulatory aspects of additives; Safety Determination of direct and Indirect Food Additives, Acceptable daily intake (ADI), estimated daily intake (EDI); Nutraceuticals regulation (FSSAI), Clinical testing of nutraceuticals and health foods; Interactions of prescription drugs, food, alcohol and nutraceuticals; Adverse effects and toxicity of Nutraceuticals
