ANNEXURE - III

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI - 620015
TEMPORARY FACULTY RECRUITMENT - JULY 2018

SYLLABUS FOR WRITTEN TEST

DEPARTMENT OF CIVIL ENGINEERING

SECTION 1: ENGINEERING MATHEMATICS

Probability and Statistics: Definitions of probability and sampling theorems; Conditional probability; Discrete Random variables: Poisson and Binomial distributions; Continuous random variables: normal and exponential distributions; Descriptive statistics - Mean, median, mode and standard deviation; Hypothesis testing.

Numerical Methods: Accuracy and precision; error analysis. Numerical solutions of linear and non-linear algebraic equations; Least square approximation, Newton's and Lagrange polynomials, numerical differentiation, Integration by trapezoidal and Simpson's rule, single and multi-step methods for first order differential equations.

SECTION 2: STRUCTURAL ENGINEERING

Engineering Mechanics: System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Friction and its applications; Kinematics of point mass and rigid body; Centre of mass; Euler's equations of motion; Impulse-momentum; Energy methods; Principles of virtual work.

Solid Mechanics: Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Theories of failures; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, buckling of column, combined and direct bending stresses.

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Construction Materials and Management: Construction Materials: Structural steel - composition, material properties and behaviour; Concrete - constituents, mix design, short-term and long-term properties; Bricks and mortar; Timber; Bitumen. Construction Management: Types of construction projects; Tendering and construction contracts; Rate analysis and standard specifications; Cost estimation; Project planning and network analysis - PERT and CPM.

Concrete Structures: Working stress, Limit state and Ultimate load design concepts; Design of beams, slabs, columns; Bond and development length; Prestressed concrete; Analysis of beam sections at transfer and service loads.

Steel Structures: Working stress and Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases; Connections – simple and eccentric, beam-column connections, plate girders and trusses; Plastic analysis of beams and frames.

SECTION 3: GEOTECHNICAL ENGINEERING

Soil Mechanics: Origin of soils, soil structure and fabric; Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability - one dimensional flow, Darcy's law; Seepage through soils - two-dimensional flow, flow nets, uplift pressure, piping; Principle of effective stress, capillarity, seepage force and quicksand condition; Compaction in laboratory and field conditions; One dimensional consolidation, time rate of consolidation; Mohr's circle, stress paths, effective and total shear strength parameters, characteristics of clays and sand.

Foundation Engineering: Sub-surface investigations - scope, drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Earth pressure theories - Rankine and Coulomb; Stability of slopes - finite and infinite slopes, method of slices and Bishop's method; Stress distribution in soils - Boussinesq's and Westergaard's theories, pressure bulbs; Shallow foundations - Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep

foundations - types of piles, dynamic and static formulae, load capacity of piles in sands and clays, pile load test, negative skin friction.

SECTION 4: WATER RESOURCES ENGINEERING

Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum, energy and corresponding equations; Potential flow, applications of momentum and energy equations; Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth.

Hydraulics: Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Kinematics of flow, velocity triangles; Basics of hydraulic machines, specific speed of pumps and turbines; Channel Hydraulics - Energy-depth relationships, specific energy, critical flow, slope profile, hydraulic jump, uniform flow and gradually varied flow

Hydrology: Hydrologic cycle, precipitation, evaporation, evapo-transpiration, watershed, infiltration, unit hydrographs, hydrograph analysis, flood estimation and routing, reservoir capacity, reservoir and channel routing, surface run-off models, ground water hydrology - steady state well hydraulics and aquifers; Application of Darcy's law.

Irrigation: Duty, delta, estimation of evapo-transpiration; Crop water requirements; Design of lined and unlined canals, head works, gravity dams and spillways; Design of weirs on permeable foundation; Types of irrigation systems, irrigation methods; Water logging and drainage; Canal regulatory works, cross-drainage structures, outlets and escapes.

SECTION 5: ENVIRONMENTAL ENGINEERING

Water and Waste Water: Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, effluent discharge standards. Domestic wastewater treatment, quantity of characteristics of domestic wastewater, primary and secondary treatment. Unit operations and unit processes of domestic wastewater, sludge disposal.

Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

Noise Pollution: Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

SECTION 6: TRANSPORTATION ENGINEERING

Transportation Infrastructure: Highway alignment and engineering surveys; Geometric design of highways - cross-sectional elements, sight distances, horizontal and vertical alignment; Components and Geometric design of railway track; Airport runway length and orientation, taxiway and exit taxiway design.

Highway Pavements: Highway materials - desirable properties and quality control tests; Design of bituminous paving mixes; Design factors for flexible and rigid pavements; Design of flexible pavement using IRC: 37-2012; Design of rigid pavements using IRC: 58-2011; Distresses in flexible and rigid pavements.

Traffic Engineering: Traffic studies on flow, speed, travel time - delay and O-D studies, PCU, peak hour factor, parking study, accident study and analysis, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Control devices, signal design by Webster's method; Types of intersections and channelization; Highway capacity and level of service of rural highways and urban roads.

SECTION 7: GEOMATICS ENGINEERING

Principles of surveying; Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey; Total station; Horizontal and vertical curves.

Photogrammetry - scale, flying height; Remote sensing - basics, platform and sensors, visual image interpretation; Basics of Geographical information system (GIS) and Geographical Positioning system (GPS).

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

1. Data Structures and Algorithms

Development of Algorithms - Notations, Concepts - Arrays - Linked lists - Stacks and queues Trees - Tree Traversing - Operations on Binary Trees – Sorting and Searching techniques - Graphs - BFS, DFS - Shortest path problems.

2. Operating Systems

Basic OS Concepts - Thread and process scheduling - Synchronization - Semaphores - Critical regions - Deadlock prevention and recovery - Memory Management - File Management - I/O Management – Case Studies on Windows and Linux OS.

3. Computer Organization and Architecture

Basic structure of Computers - Arithmetic - Addition & subtraction of signed numbers - Multiplication - Integer division - Floating point operations - Pipelining - Multiple bus organization - Micro programmed control – Hazards - Memory System - Semiconductor RAM memory - Cache memory - Virtual memory - Secondary storage - I/O Organization - Interrupts - DMA - Buses - Interface circuits - Serial communication links.

4. C Programming

C programming – Memory Concepts – Arithmetic Operations - Control Statements – Functions - Pointers – Structures – User Defined Data types - File handling.

5. Microprocessors

8085 processor - Architecture - Bus organization - Registers - ALU - Instruction set of 8085 - Instruction format - Addressing modes - System design using controllers - Microprocessor Interfacing Techniques - Segmented memory concepts - Bus concepts.

6. Computer Networks

Goals of networking, well-known applications such as email, ftp, and need for layered architecture OSI and Internet. Hosttohost communication: RS 232 over serial line; handshaking and error handling; packet switching; reliable transmission stop and wait, sliding window; logical connections. Multiple collocated hosts: addressing, LAN access methods; CSMA/CD, Ethernet, Token passing.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Mathematics for electrical engineers;

Electric circuits, signals and systems and field theory;

DC machines, transformers and ac machines;

Transmission & distribution systems, power systems - analysis, operation & control;

Control systems;

Electrical and electronics measurements;

Power electronics and drives;

Analog and digital electronics – integrated circuits;

Microprocessors and basics of computers;

Communication systems

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Devices and Electronic Circuits, Network Analysis and Synthesis, Signals & Systems, DSP, ADSP, Electromagnetic Theory, Transmission lines, Antennas and Wave Propagations, Metamaterial Antennas, MIC, MICROSTRIP and STRIPLINE fundamentals, Microwave electronics, Microwave Components and Circuits, Statistical theory of Communication, Analog and Digital Communication, Wireless Communication, Broadband Access Technologies, Fiber optics and Optical communication, Satellite Communication, Digital Systems, Analog Integrated Circuits, Microprocessors, Microcontrollers, Embedded systems, ARM system, DSP Processors, Basics of VLSI, Digital VLSI, Analog IC Design, Verilog HDL, ASIC, DSP for VLSI, VLSI Testing, Low Power VLSI, EDA Tools, Computer Networks and Protocols, Computer Architecture and Organization, DIP, Ad Hoc Networks.

DEPARTMENT OF INSTRUMENTATION & CONTROL ENGINEERING

Engineering Mathematics: Linear Algebra, Differential Equations, Probability and Statistics, Numerical Methods

Voltage and Current Sources, network theorems, DC & AC circuit analysis, One port & two port Networks, basic signals, system classification, Laplace, Fourier and z-transforms, Convolution, correlation, DFT, FFT, Basic IIR & FIR Filters

Control Systems: Feedback principles, signal flow graphs, transient response, steady-state-errors, Bode plot, phase and gain margins, Routh and Nyquist criteria, root loci, design of lead, lag and lead-lag compensators, state-space representation of systems; time-delay systems; Mechanical, hydraulic and pneumatic system components, synchro pair, servo and stepper motors, servo valves; On-off, P, P-I, P-I-D, cascade, feed forward, and ratio controllers

Sensors and Industrial Instrumentation: Resistive-, capacitive-, inductive-, piezoelectric-, Hall effect sensors and associated signal conditioning circuits; Transducers for industrial instrumentation: displacement (linear and angular), velocity, acceleration, force, torque, vibration, shock, pressure (including low pressure), flow (differential pressure, variable area, electromagnetic, ultrasonic, turbine and open channel flow etc

Characteristics of operational amplifiers and its applications, Combinational and sequential logic circuits, IC family (TTL & CMOS), Characteristics of MUX, ADC and DAC , 8-bit microprocessor and microcontroller: applications, memory and input-output interfacing, Basics of data acquisition systems

Measurements: systematic and random errors in measurement, expression of uncertainty - accuracy and precision index, propagation of errors. PMMC, MI and dynamometer type instruments; dc potentiometer; Bridges for measurement of R, L and C, Q-meter. Measurement of voltage, current and power in single and three phase circuits, AC and DC current probes, timer/counter, time, phase and frequency measurements, digital voltmeter, digital multimeter, Oscilloscope, shielding and grounding

DEPARTMENT OF MECHANICAL ENGINEERING

MATHEMATICS

Differential equations/calculus, statistics, reliability functions, Fourier equations, transfer functions

THERMAL SCIENCES

Fluid properties; fluid statics, manometry; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, flow through pipes, head losses in pipes, bends and fittings.

Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, free and forced convective heat transfer, heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan Boltzmann law, Wien's displacement law, black and grey surfaces.

Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.

DESIGN

Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations, collisions.

Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.

Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

INDUSTRIAL SAFETY ENGINEERING

Fire and explosion safety, Safety Management and safety in material handling

DEPARTMENT OF METALLURGICAL & MATERIALS ENGINEERING

Crystallography, Phase diagrams, Fe-C equilibrium diagram, CCT and TTT diagrams, heat treatment - Deformation mechanisms, tensile, compression, hardness, fatigue, and creep - general concept and testing methods - Basic thermodynamic concepts - Iron and Steel Making, Extraction of Copper, aluminum, Magnesium, Zinc and Titanium - Optical and electron microscopy and X-ray diffraction techniques

DEPARTMENT OF PRODUCTION ENGINEERING

ENGINEERING MATHEMATICS:

Linear Algebra, Calculus, Differential equations:

Complex variables: Probability and Statistics: Numerical Methods:

GENERAL ENGINEERING: Engineering Materials: Applied Mechanics: Theory of Machines and Design:

PRODUCTION ENGINEERING: Metal Casting: Metal Forming: Metal Joining Processes: Machining and Machine Tool Operations: Tool Engineering: Metrology and Inspection: Powder Metallurgy: Polymers and Composites: Manufacturing Analysis: Computer Integrated Manufacturing

INDUSTRIAL ENGINEERING: Product Design and Development: Engineering Economy and Costing: Work System Design: Facility Design: Production Planning and Inventory Control: Operation Research: Quality Management: Reliability and Maintenance: Management Information System. Intellectual Property System.

DEPARTMENT OF ENERGY & ENVIRONMENT

1. Heat Transfer: Conduction, convection and radiation, heat transfer coefficients, steady and unsteady heat conduction, boiling, condensation and evaporation; types of heat exchangers and evaporators and their design.

2. Mass Transfer : Fick's laws, molecular diffusion in fluids, mass transfer coefficients, Mass transfer theories; momentum,Analogies, stage wise and continuous contacting and stage efficiencies; HTU & NTU concepts design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification and adsorption.

3. Fluid Mechanics : Fluid statics, Newtonian and non-Newtonian fluids, Bernoulli equation, Macroscopic friction factors, energy balance, dimensional analysis, shell balances, flow through pipeline systems, flow meters, pumps and compressors, packed and fluidized beds

4. Basics of Electrical Engineering

5. Wind Energy: Wind energy basics, wind energy generators
6. Solar energy.: Basics of solar energy, types of collectors, Applications of solar energy for cooling and heating

7. Fuel cells , their types and applications

8 Air Pollution.: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits

9 Water Pollution. : Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements,Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards.

10. Bio process engineering and down stream processing.

DEPARTMENT OF PHYSICS

Mathematical Physics: Determinants and matrices – Vector analysis – Complex analysis – Ordinary differential equations – Fourier analysis.

Classical Mechanics: Lagrangian formulation – Central force problem – Hamiltonian formulation – Rigid body motion – Special theory of relativity.

Quantum Mechanics: Schrodinger Equation – Operators and eigenfunctions – solvable problems – angular momentum and spin – approximation methods – scattering theory.

Electronics: Network analysis – semiconductor devices – amplifiers and oscillators – operational amplifiers – digital circuits.

Electromagnetic Theory: Electrostatics – Magnetostatics – Maxwell equations – Electromagnetic waves and propagation.

Statistical Mechanics: Thermodynamics – Ensemble theory – Maxwell-Boltzmann statistics – Bose-Einstein statistics – Fermi-Dirac statistics.

Solid State Physics: Crystal structure – Lattice vibrations and thermal properties – conductors – semiconductors – dielectrics – magnetic materials.

Atomic and Molecular Physics: Atomic spectra – resonance spectroscopy – IR and microwave spectroscopy – electronic spectroscopy.

Nuclear Physics: Nuclear forces – nuclear models – radioactivity – nuclear reactions – elementary particles

DEPARTMENT OF CHEMISTRY

Aliphatic Nucleophilic Substitution– reactivity, structural and solvent effects, substitution in SN1, SN2, SNi. Neighboring group participation -Norbornyl and bridgehead systems, substitution at allylic and vinylic carbons, substitution by ambident nucleophiles. Reactive intermediates-Carbenes, nitrenes, radicals, ylides-Formation, stability and their applications.

Addition to carbon-carbon multiple bonds: Electrophilic, nucleophilic and free radical addition. Stereochemistry and orientation of the addition. Hydrogenation, Halogenation, hydroxylation, hydroboration. Addition to carbonyl compounds- 1,2 and 1,4-addition, benzoin, Knoevenegal, stobbe and Darzen glycidic ester reactions. Stereochemistry of Aldol and Michael addition reactions- Felkin- Ahn Model

Theories of coordination compounds - VB theory - CFT - splitting of d orbitals in ligand fields and different symmetries - CFSE - factors affecting the magnitude of 10 Dq - evidence for crystal field stabilization - spectrochemical series - site selection in spinels - tetragonal distortion from octahedral symmetry - Jahn-Teller distortion - Nephelauxetic effect – MOtheory - octahedral - tetrahedral and square planar complexes - -bonding and molecular orbital theory - experimental evidence for-bonding.

Electronic spectra and magnetism: Microstates, terms and energy levels for d1 – d9 ions in cubic and square fields - selection rules - band intensities and band widths - Orgel and Tanabe-Sugano diagrams - evaluation of 10 Dq and β for octahedral complexes of cobalt and nickel - charge transfer spectra -magnetic properties of coordination compounds - change in magnetic properties of complexes in terms of spin orbit coupling - temperature independent paramagnetism - spin cross over phenomena.

Group theory-I: Elements of group theory, definition, group multiplication tables, conjugate classes, conjugate and normal subgroups, symmetry elements and operations, point groups, assignment of point groups to molecules, Matrix representation of geometric transformation and point group, reducible and irreducible representations, construction of character tables, bases for irreducible representation, direct product, symmetry adapted linear combinations, projection operators. Orthogonalitytheorem - its consequences.

Chemical kinetics: Simultaneous reactions - opposing, parallel and consecutive reactions, the steady state approximation - theories of reaction rates-transition state theory and collision theory a comparison - enthalpy, entropy and free energy of activation, potential energy surfaces, reaction coordinates, kinetic isotope effects, factors determining reaction rates in solution, solvent dielectric constant and ionic strength. Chain reactions - linear reactions, branching chains - explosion limits; Rice–Herzfeld scheme; kinetics of free radical polymerization reactions. Enzyme catalysis - rates of enzyme catalysed reactions - effect of substrate concentration, pH and temperature - determination of Michael's parameters.

DEPARTMENT OF MATHEMATICS

List of topics (up to M. Sc., level) given below for written test.

Algebra, Matrix, Calculus, Differential Equations, Partial Differential Equations, Real Analysis, Complex Analysis, Integral Transforms, Numerical Methods, Fourier Series, Probability and Statistics.

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCE

ECONOMICS

Demand – Market Demand – Elasticity of Demand – Supply – Elasticity of Supply – Cost and Revenue Analysis – Market Morphology – Break Even Analysis.

National Income – Keynesian Theory of Employment – Multiplier – Accelerator – Trade Cycle – Inflation – Philip's Curve – Exchange Rate Determination – Balance of Payment and Trade – Shifting and Incidence of Taxes.

Probability Distributions – Sampling – Testing of Hypotheses – Regression Analysis – (with special reference to R^2) Adjusted R^2 – Error term – Time Series – (with special reference to Unit Root, Co integration tests) – Vector Error Correction – Causality Test.

ENGLISH

Literature

Chaucer to the 20th Century - Contemporary British Literature - American and other non-British Literatures - European Literature - Indian writing in English and Indian Literature in English translation - New Literatures in English - Commonwealth Literature- Literary Theory and Criticism.

Linguistics and Applied Linguistics

Language and linguistics – Relevance of linguistics to language teaching - Language acquisition and learning – Behaviourist and Cognitivist schools - L 2 Acquisition and learning – Theories of SLA and SLL - Theories of language teaching - English for specific purposes - Evaluation methods and testing techniques - Teacher orientation and training – Computer Assisted Language Learning.

DEPARTMENT OF COMPUTER APPLICATIONS

1. Computer Organization and Architecture
2. Data Base Management Systems
3. Operating Systems
4. Computer Networks
5. Programming Languages
6. Data Structures and Algorithms
7. Software Engineering

DEPARTMENT OF MANAGEMENT STUDIES

Introduction to Production Management History of Production Management. Technology Management: Forecasting — Environment – product Design &Development Process Planting - Types of Production System - Tools for selecting the process.

Plant Locations and Layout Plant location: Factors to be considered- Multi Plant Location - Evaluation of Factors using Rations plan & Cost Analysis - Plant location trends. Plant Layout: Types of Layout - Quantitative analysis in plant layout Material Handling — Principles.

Job design techniques Job design: Scientific Method - Job Enrichment - Job Enlargement - Working Condition — Safety.

Job evaluations methods Job Evaluation. Work Measurement: Time Study - Work Sampling.

Materials management Purchasing and Warehousing Functions - Vendor Development and Rating. Value Analysis.

Building a strategic framework to analyse supply chains Fundamentals of Supply Chain Management, Supply chain networks, Integrated supply chain planning, Decision phases in s supply chain, process view of a supply chain, supply chain flows, Overview of supply chain models and modeling systems, Supply chain planning: Strategic, operational and tactical, Understanding supply chain through process mapping and process flow chart.

Designing the supply chain network Supply chain strategies, achieving strategic fit, value chain, Supply chain drivers and obstacles, Strategic Alliances and Outsourcing, purchasing aspects of supply chain, Supply chain performance measurement: The balanced score card approach, Performance Metrics. Planning demand and supply: Demand forecasting in supply chain, Aggregate planning in supply chain, Predictable variability.

Planning demand and supply in a supply chain Planning and managing inventories: Introduction to Supply Chain Inventory Management. Inventory theory models: Economic Order Quantity Models, Reorder Point Models and Multiechelon Inventory Systems, Relevant deterministic and stochastic inventory models and Vendor managed inventory models.

Designing and planning transportation networks Distribution Management: Role of transportation in a supply chain - direct shipment, warehousing, cross-docking; push vs. pull systems; transportation decisions (mode selection, fleet size), market channel structure, vehicle routing problem. Facilities decisions in a supply chain. Mathematical foundations of distribution management, Supply chain facility layout and capacity planning,

Revenue Management Role of Pricing and Revenue Management in a Supply Chain; Pricing and Revenue Management for Multiple Customer Segments; Pricing and Revenue Management for Perishable Assets; Pricing and Revenue Management for Seasonal Demand; Pricing and Revenue Management for Bulk and Spot Contracts. Role of IT in Pricing and Revenue Management