VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY: BURLA

(Formerly University College of Engineering, Burla-Established by Govt. of Odisha in 1956 & Upgraded in 2009 to A State Govt. University Covered under Section 2(f) & 12(B) of UGC Act.)

P.O : Engineering College, Burla (Siddhi Vihar), Dist : Sambalpur Odisha -768018, INDIA
Ph : 0663-2430211, Fax : 0663-2430204 Website : www.vssut.ac.in

No.VSSUT/PGSR/ Dated:

N O T I C E

Sub : List of candidates short listed for Written Test and Interview for admission into Ph.D Programme Spring 2017.

This is for information of all concerned that the **Written Test and Interview of Ph.D Programme Spring 2017 shall be held from 24.01.2017 to 25.01.2017 at VSSUT, Burla as per detailed given below.** Further, it is to inform that the following candidates have been short-listed for the Written Test and Interview as applicable. The eligible candidates are required to bring their original documents as mentioned in the list and one set of attested copy of the same specified in the notice for verification.

The interview of the qualified candidates in the Written Test shall be conducted on the same day. Moreover, the candidates, those are exempted from the Written Test as per the regulation, shall also appear interview directly on the same day afternoon. The candidates who fail to produce the original documents shall not be allowed for the interview. **No separate intimation for appearing the Written Test and/or interview as applicable shall be sent to the candidates. Candidates are required to bring their Photo Identity card issued by Government/Institution for verification at the Examination Hall. Those who have not submitted their original GATE/NET Score Cards are required to submit the same at the time of Interview positively.** The Written Test will be of single paper consisting of 40 multiple questions of 40 minutes duration as per syllabus available in our University website: www.vssut.ac.in. The Written Test will start at 10.00 AM. The candidates are required to report at least 40 minutes before commencement of examination. No candidate will be allowed to appear the test after commencement of Written Test.

PROGRAMME (FOR WITTEN TEST)

Date	Time of Written Test	Departments
24.01.2017	10.00 AM	Physics, Chemistry, Mathematics, Humanities, Electrical Engineering, Production Engineering & Metallurgy & Materials Engineering
25.01.2017	10.00 AM	Mechanical Engineering, Electronics & Tele-communication Engineering, Civil Engineering, Computer Science & Engineering & Information Technology.

PROGRAMME FOR INTERVIEW (For written test qualified/exempted only)

Date	Time of Interview	Departments
24.01.2017	3.00 PM	Physics, Chemistry, Mathematics, Humanities, Electrical Engineering, Production Engineering & Metallurgy & Materials Engineering
25.01.2017	3.00 PM	Mechanical Engineering, Electronics & Tele-communication Engineering, Civil Engineering, Computer Science & Engineering, Information Technology & Chemical Engineering

Civil Engineering (5)

Sl.No.	Roll No.	Name of the Candidate	Father/Husband's Name	Written Test/ Interview
1	CE 01	Amit Kumar Sharma	Prafulla Kumar Sharma	Written Test
2	CE 02	Jyotirmoy Mishra	Bhramarbar Mishra	Written Test
3	CE 03	Stutee Mohanty	Bimal Kumar Mohanty	Written Test
4	CE 04	Bibhu Prasad Lenka	Braja Kishore Lenka	Written Test
5	CE 05	Priyanka Pradhan	Bata Krushna Pradhan	Written Test

Mechanical Engineering (13)

1	ME 01	Dilip Kumar Subudhi	Dandapani Subudhi	Written Test
2	ME 02	Rabinarayan Bag	Amulya Kumar Bag	Written Test
3	ME 03	Tapan Kumar Mall	Nanda Kishore Mall	Written Test
4	ME 04	Sushanta Kumar Pradhan	Gngadhar Pradhan	Written Test
5	ME 05	Bishnupada Roul	Madhusudan Roul	Written Test
6	ME 06	Sasmita Kar	Chitta Ranjan Dash	Written Test
7	ME 07	Dibyanandan Dash	Durga Prasanna Dash	Written Test
8	ME 08	Sindhusuta Rout	Jayanta Mohanty	Written Test
9	ME 09	Deepak Buda	Mangal Buda	**Interview**
10	ME 10	Sunita Panigrahi	Ramesh Chandra Panigrahi	Written Test
11	ME 11	Laxminarayan R.	Ramachandra V. Bhandarkar	**Interview**
12	ME 12	Rashmi Ranjan Swain	Narahari Swain	Written Test
13	ME 13	K.Rajesh Kumar	K.Ram Mohan Rao	Written Test

Electrical Engineering (23)

1	EE 01	Shikharani Naik	Shishir Chandra Patel	Written Test
2	EE 02	Deba Pritam Mishra	Nilakantha Mishra	Written Test
3	EE 03	Raji Krishna	Raji Manikyam	Written Test
4	EE 04	Ashit Kumar Hota	Kishore Chandra Hota	**Interview**
5	EE 05	Rajashree Sahu	Rasananda Sahu	Written Test
6	EE 06	Srikant Misra	Sripati Misra	Written Test
7	EE 07	Shyama Sundar Padhi	Raghubir Padhi	Written Test
8	EE 08	Pratap Chandra Nayak	Purna Chandra Nayak	**Interview**
9	EE 09	Krishna Rout	Sudhanshu Sekhar Rout	Written Test
10	EE 10	Soumya Kanta Bal	Kumuda Chandra Bal	Written Test
11	EE 11	Anwesha Panigrahi	Arupananda Panigrahi	**Interview**
12	EE 12	Tapaswini Routray	Santosh Kumar Routray	Written Test
13	EE 13	Mukesh Kumar Sukla	Kashinath Sukla	Written Test
14	EE 14	Chintu Jagan Mohana Rao	Chintu Narasimhulu	Written Test
15	EE 15	Abhilash Pradhan	Bihari Charan Pradhan	Written Test
16	EE 16	Tentu Papinaidu	Tentu Satyam	Written Test
17	EE 17	K.D. Malleswara Rao	K. Vekaichalapathi	Written Test
18	EE 18	Anshuman Bhuyan	Umakanta Bhuyan	Written Test
19	EE 19	Sudhir Kumar Mahapatra	Ashok Kumar Mahapatra	Written Test
20	EE 20	Sushree Shataroopa Mohapatra	Gopal Prasad Mohapatra	Written Test
21	EE 21	Prajnadipta Sahoo	Jaladhar Sahoo	Written Test
22	EE 22	Kamalesh Chandra Rout	Kailash Chandra Rout	Written Test
23	EE 23	Manish Kumar Babu	Rabindra Kumar Babu	Written Test

Electronics & Telecommunication Engineering (20)

1	ETC 01	Md Akram Ahmad	Sirajuddin Ansari	**Interview**
2	ETC 02	Sarthak Panda	Sripati Panda	Written Test
3	ETC 03	Subhashree Samal	Akshaya Kumar Samal	Written Test
4	ETC 04	VCH Sekhar Rao Rayavarapu	Satyanarayana Rayavarapu	Written Test
5	ETC 05	Aradhana Raju	Gangadhara Raju	Written Test
6	ETC 06	Priya Ranjan Meher	Himansu Sekhar Meher	Written Test
7	ETC 07	Lakkoju Siva Prasad Rao	Lakkoju Krishna Rao	**Interview**
8	ETC 08	Dhananjaya Tripathy	Mrutyunjay Tripathy	**Interview**
9	ETC 09	Mahesh Kumar Jalagam	S. Satyanarayana	Written Test
10	ETC 10	Santosh Kumar Acharya	Kartik Chandra Acharya	Written Test
11	ETC 11	Gyanesh Das	Trailokya Nath Das	Written Test
12	ETC 12	Ayesha Mohanty	Gournga Charan Mohanty	Written Test
13	ETC 13	Biswa Ranjan Swain	Duryodhan Swain	Written Test
14	ETC 14	Sumant Kumar Mohapatra	Nrusingha Charan Mohapatra	Written Test
15	ETC 15	Sanjay Kumar Ray	Ajaya Kumar Ray	Written Test
16	ETC 16	Jeevankumar Vajja	V.Simhachalam	Written Test
17	ETC 17	Monalisa Rout	Bhagaban Rout	Written Test
18	ETC 18	Bhagaban Kumar Behera	Narasingha Behera	Written Test
19	ETC 19	Prabhudutta Pradhan	Niranjan Pradhan	Written Test
20	ETC 20	Bibhuti Bhusan Sahu	Narayan Chandra Sahu	Written Test

Computer Science & Engineering (14)

1	CSE 01	Arabinda Dash	Rabindranath Dash	Written Test
2	CSE 02	Tanmay Kumar Behera	Sridhar Behera	**Interview**
3	CSE 03	Lalit Mohan Ray	Narahari Ray	Written Test
4	CSE 04	Ajit Kumar Pasayat	Prabodh Kumar Pasayat	Written Test
5	CSE 05	Pujasuman Tripathy	Bidhu Bhusan Tripathy	Written Test
6	CSE 06	Pradipta Kumar Mishra	Rabinarayan Mishra	Written Test
7	CSE 07	Pritismita Babu	Prem Narayan Babu	**Interview**
8	CSE 08	Rakesh Kumar Lenka	Mihir Kumar Lenka	**Interview**
9	CSE 09	Kaushik Mishra	Kishore Chandra Mishra	Written Test
10	CSE 10	Gopal Krishna Behera	Naba Kishore Behera	**Interview**
11	CSE 11	Rasmita Panigrahi	Neelamadhab Padhy	Written Test
12	CSE 12	Murali Krishna Senapaty	Jagadish Kumar Senapathy	Written Test
13	CSE 13	Sitansu Mishra	Siba Prasad Mishra	Written Test
14	CSE 14	Priyanka Swain	Pramod Kumar Swain	Written Test

Information Technology (1)

1	IT 01	Himansu Das	Jogendra Das	Written Test

Metallurgy & Materials Engg. (1)

1	MME	Balbir Singh	Ram Singh	Written Test

Production Engineering (7)

Sl.No.	Roll No.	Name of the Candidate	Father/Husband's Name	Written Test/ Interview
1	PE 01	Rabinarayan Bag	Amulya Kumar Bag	Written Test
2	PE 02	Sitesh Mahapatra	Satrughan Mahapatra	Written Test
3	PE 03	Smita Padhan	Iswar Padhan	Written Test
4	PE 04	Sambeet Kumar Sahu	Golak Bihari Sahu	**Interview**
5	PE 05	Deepak Buda	Mangal Buda	**Interview**
6	PE 06	Rashmi Ranjan Swain	Narahari Swain	Written Test
7	PE 07	Satya Prakash Barpanda	Manbhanjan Barpanda	Written Test

Chemical Engineering (1)

1	CHE 01	Nivedita Patel	Krishna Kumar Gupta	**Interview**

Physics (02)

1	PH 01	Sakti Prasad Mishra	Sudhir Kumar Mishra	Written Test
2	PH 02	Anannya Dutta	Sibnath Dutta	Written Test

Chemistry (09)

1	CH 01	Bisikeshan Dalei	Nityananda Dalei	Written Test
2	CH 02	Bharat Chandra Kalapahad	Suhakar Kalapahad	Written Test
3	CH 03	Soumya Ranjan Kar	Susil Kumar Kar	Written Test
4	CH 04	Rabiranjan Prusty	Sushil Kumar Prusty	Written Test
5	CH 05	Prajna Paramita Nayak	Tapan Kumar Nayak	Written Test
6	CH 06	Priyanka Saha	Bhagawan Saha	Written Test
7	CH 07	Rubi Behura	Biman Bihari Behura	Written Test
8	CH 08	Manasi Panda	Suresh Chandra Panda	Written Test
9	CH 09	Debalina Panda	Harish Chandra Panda	Written Test

Mathematics (09)

1	MATH 01	Hrushikesh Jena	Damodar Jena	**Interview**
2	MATH 02	Chapala Sahoo	Arup Ranjan Sahoo	Written Test
3	MATH 03	Jyoti Panigrahi	Narendra Nath Panigrahi	Written Test
4	MATH 04	Madhusudan Patro	Rajib Lochan Patro	Written Test
5	MATH 05	Deepak Kumar Nayak	Dibakar Nayak	Written Test
6	MATH 06	Pravat Malik	Prafulla Kumar Malik	Written Test
7	MATH 07	Boina Anil Kumar	Boina Rama Rao	Written Test
8	MATH 08	Niran Meher	Dina Meher	**Interview**
9	MATH 09	Madhusudan Senapati	Parsuram Senapati	Written Test

English (1)

1	ENG 02	Avisek Pattnaik	Radha Raman Mohanty	Written Test

LIST OF DOCUMENTS TO BE PRODUCED AT THE TIME OF INTERVIEW

Sl. No.	Documents for verification
1	Identity Proof (Voter ID/PAN/Adhar Card/Driving License)
2	HSC or equivalent Examination certificate showing date of birth
3	Pass Certificate of the +2 Science/Diploma Examination
4	Pass Certificates of +3 Science Examination
5	Pass Certificate of B.Tech./BE/B.Sc.(Engg.)/MCA/M.Sc. Examination
6	Pass Certificate of M.Tech./ME/M.Sc.(Engg.) Examination
7	Pass Certificate of M.Phil/MA/MBA Examination
8	Memorandum of Marks of M.Phil/MA/MBA Examination
9	Memorandum of Marks of HSC Examination or equivalent Examination
10	Memorandum of Marks of +2 Science/Diploma Examination
11	Memorandum of Marks of +3 Science Examination
12	Memorandum of Marks of B.Tech./BE/B.Sc.(Engg.)/MCA/M.Sc. Examination
13	Memorandum of Marks of M.Tech./ME/M.Sc.(Engg.)/M.Phil/MA/MBA Examination
14	Certificate in support of SC/ST category as the case may be
15	Original GATE/NET/Inspired Fellowship/ Letter of any fellowship from Government Agencies

Sd/- Dean, PGS & R

SYLLABUS FOR WRITTEN TEST

CIVIL ENGINEERING

1. Engineering Mechanics, Strength of Materials and Structural Analysis

Engineering Mechanics: Principle of virtual work, equivalent force system.First and Second Moment of area, Mass moment of Inertia.Static Friction. Kinematics and Kinetics: Kinematics in Cartesian Co-ordinates, motion under uniform and nonuniform acceleration, motion under gravity. Kinetics of particle: Momentum and Energy principles, collision of elastic bodies, rotation of rigid bodies.

Strength of Materials: Simple Stress and Strain, Elastic constants, axially loaded compression members, Shear force and bending moment, theory of simple bending, Shear Stress distribution across cross sections, Beams of uniform strength. Deflection of beams: Macaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method. Torsion of Shafts, Elastic stability of columns, Euler's Rankine's and Secant formulae.

Structural Analysis: Castiglianio's theorems, Slopedeflection, moment distribution, Rolling loads and Influences lines: Influences lines for Shear Force and Bending moment at a section of beam. Criteria for maximum shear force and bending Moment in beams traversed by a system of moving loads. Influences lines for simply supported plane pin jointed trusses. Arches: Three hinged, two hinged and fixed arches. Matrix methods of analysis Plastic Analysis of beams and frames: Theory of plastic bending, plastic analysis, statical method, Mechanism method. Unsymmetrical bending: Moment of inertia, product of inertia, Neutral Axis and Principle axes, bending stresses.

2. Design of Structures: Steel, Concrete
Structural Steel Design: Structural Steel: Riveted, bolted and welded joints and connections. Design of tension and compression member, beams of built up section, riveted and welded plate girders, gantry girders, stancheons with battens and lacings.
Design of Concrete : Concept of mix design. Reinforced Concrete: Working Stress and Limit State method of design-Recommendations of I.S. codes Design of one way and two way slabs, stair-case slabs, simple and continuous beams of rectangular, T and L sections. Compression members under direct load with or without eccentricity, Cantilever and Counter fort type retaining walls. Prestressed concrete: Methods and systems of prestressing, anchorages, Analysis and design of sections for flexure based on working stress, loss of prestress.

3. Fluid Mechanics, Open Channel Flow, Hydraulic Machines, Hydrology, Water Resources and Engineering:

Fluid Mechanics: Fluid properties and their role in fluid motion, fluid statics, Kinematics and Dynamics of Fluid flow,.Continuity, momentum and energy equation, Navier-Stokes equation, Euler's equation of motion, application to fluid flow problems, pipe flow, sluice gates, weirs. Laminar flow between parallel, stationary and moving plates, flow through tube. Laminar and turbulent boundary layer on a flat plate, laminar sub layer, smooth and rough boundaries, drag and lift. Turbulent flow through pipes: Characteris-tics of turbulent flow, velocity distribution and variation of pipe friction factor, hydraulic grade line and total energy line. Uniform and non-uniform flows, Hydraulic turbines, types classification, Choice of turbines, performance parameters, controls, characteristics, specific speed. **Hydrology:** Hydrological cycle, precipitation, evaporation, transpiration, infiltration, overland flow, hydrograph, flood frequency analysis, flood routing through a reservoir, channel flow routing-Muskingam method.

Water Resources Engineering: Ground and surface water resource, single and multipurpose projects, storage capacity of reservoirs, reservoir losses, reservoir sedimentation.

Irrigation Engineering: (i) Water requirements of crops: consumptive use, duty and delta, irrigation methods and their efficiencies. (ii) Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals, their design, regime theory, critical shear stress, bed load. (iii) Canal structures (iv) Diversion headwork: Principles and design of weirs of permeable and impermeable foundation, Khosla's theory, energy dissipation. (v) Storage works (vi) Spillways (viii) River training:.

4. Geotechnical Engineering: Soil Type and structure - gradation and particle size distribution - consistency limits. Water in soil - capillary and structural - effective stress and pore water pressure - permeability concept - field and laboratory determination of permeability - Seepage pressure - quick sand conditions - Shear strength determination - Mohr Coulomb concept.Compaction of soil - Laboratory and field tests.Compressibility and consolidation concept - consolidation theory - consolidation settlement analysis.Earth pressure theory and analysis for retaining walls, Application for sheet piles and Braced excavation. Bearing capacity of soil - approaches for analysis - settlement analysis - stability of slope of earth walk. Subsurface exploration of soils - methods Foundation - Type and selection criteria for foundation of structures - Design criteria for foundation - Analysis of distribution of stress for footings and pile - pile group action-pile load test. Ground improvement techniques.

5. Transportation Engineering :

Railway Engineering: Permanent way - components, types and their functions - Functions and Design of turn and crossings - Necessity of geometric design of track - Design of station and yards.

Highway Engineering: Principles of Highway alignments - classification and geometrical design elements and standards for Roads. Design principles and methodology of flexible and rigid pavements. Typical construction methods and standards of materials for stabilized soil, WBM, Bituminous works and CC roads. Surface and sub-surface drainage arrangements for roads. Pavement distresses and strengthening by overlays. Traffic surveys and their applications in traffic planning - Typical design features for channelized, intersection, rotary etc - signal designs - standard Traffic signs and markings.

6. Environmental Engineering:

Water Supply: Predicting demand for water, impurities of water and their significance, physical, chemical and bacteriological analysis, waterborne diseases, standards for potable water. Water treatment: principles of coagulation, flocculation and sedimentation; slow-; rapid-, pressure-, filters; chlorination, softening, removal of taste, odour and salinity.

Sewerage systems: Domestic and industrial wastes, storm sewage-separate and combined systems, flow through sewers, design of sewers.BOD, COD, solids, dissolved oxygen, nitrogen and TOC. Standards of disposal in normal watercourse and on land.

Sewage treatment& Solid waste: Working principles, units, chambers, sedimentation tanks, trickling filters, oxidation ponds, activated sludge process, septic tank, disposal of sludge, recycling of wastewater.Collection and disposal in rural and urban contexts, management of long-term ill effects.

MECHANICAL ENGINEERING

Section 1: Applied Mechanics and Design

Engineering Mechanics:
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.

Mechanics of Materials:
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.

Theory of Machines:
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.

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

Machine Design:
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.

Section 2: Fluid Mechanics and Thermal Sciences

Fluid Mechanics:
Fluid properties; fluid statics, manometry, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings.

Heat-Transfer:
Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, Heisler's charts; thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, StefanBoltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis.

Thermodynamics:
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.

Applications:
Power Engineering: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes. Turbomachinery: Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines.

Section 3: Materials, Manufacturing and Industrial Engineering

Engineering Materials:
Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.
Casting, Forming and Joining Processes:
Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.

Machining and Machine Tool Operations:
Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, design of jigs and fixtures.

Metrology and Inspection:
Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing:
Basic concepts of CAD/CAM and their integration tools.

Production Planning and Control:
Forecasting models, aggregate production planning, scheduling, materials requirement planning.

Inventory Control:
Deterministic models; safety stock inventory control systems.

Operations Research:
Linear programming, simplex method, transportation, assignment, network flow models, simple models, PERT and CPM.

ELECTRICAL ENGINEERING

Networks: Network topology, Node-pair and loop analysis of networks containing independent and dependent sources, Sinusoidal steady state analysis of single-phase and 3-phase circuits, Resonance, Symmetrical components, Magnetically coupled circuits. Fourier series and transform, Laplace transform, Analysis of RLC networks using Laplace transform, Network functions for one-port and two-port networks, Impulse response and superposition integral, Network theorems, State variables, Formulation of state equations of RLC-networks and solutions, Discrete systems.

Signals and Systems: Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem, Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.

Electromagnetic Field Theory: Vector fields. Divergence and Stokes theorems. Overview of Electrostatics and Magnetostatics. Poisson's Equation: Derivation, applications, existence and uniqueness. Dielectrics, Displacement vector. Capacitance matrix, Energy in the field.

Ampere's Law: B Field calculations. Vector potential. The magnetic dipole. Magnetization of materials.Faraday's Law: Induced emf in stationary and moving coils. Inductance. Inductance matrix. Energy in the magnetic field. Maxwell's Equation: The wave equation. Poynting theorem. Poynting theorem for phasors.

Electrical Machines: Single phase transformer, three phase transformers, instrument transformers, energy conversion principles, DC machines, induction motors, synchronous machines, parallel operation of generators, motor starting, characteristics and applications, servo and stepper motors, special machines, electrical drives.

Power Systems and High Voltage: Basic power generation concepts, transmission line models and performance, cable performance, insulation, corona and radio interference, distribution systems, per-unit quantities, bus impedance and admittance matrices, load flow, voltage control, power factor correction, economic operation, symmetrical components, fault analysis, power system protection and switch gear, HVDC transmission and FACTS concepts, power quality, Harmonics in power systems, Renewable energy systems. Power System Stability -Swing equation, single generator infinite bus model, and equal area criterion. Importance of High Voltages and HV tests; general requirements of HV testing ,testing of internal and external insulation systems. Generation of High alternating, direct and impulse voltages; measurements of alternating direct and impulse voltages and dielectric loss. Insulating materials: solids, liquids and gases; their electrical properties and applications; breakdown mechanisms in solid, liquid and gaseous dielectric; measurement of Radio interference Voltage (RIV) and partial discharges; generation and Measurement of impulse currents.

Power Electronics: Semiconductor Devices in switched mode - Diode, SCR, BJT, IGBT, MOSFET - drivers, protection, thermal aspects – ratings Figures of merit - ripple factor, average value, Harmonic factor, Distortion factor, THD, Power factor, Crest factor Power in switching circuits - 2-pulse Midpoint converter - analysis for R load, infinite inductive load, R-L load - implications of commutation overlap - use in DC drives. 3-pulse converter - analysis for R load, infinite inductive load, R-L load - implications of commutation overlap - use in DC drives. Bridge converters - three phase and single phase - analysis for R load, infinite inductive load, R-L load - implications of commutation overlap - use in DC drives.

Buck, Boost, Buck-Boost and Cuk Converters - circuit steady state analysis - current and voltage ripple estimation - discontinuous and continuous modes of operation. Use of SCR in buck converters - commutation circuit. Inverters - 120 deg. and 180 deg. conduction operation – selective harmonic elimination - McMurray inverter - SPWM, unipolar and bipolar switching Single phase AC Voltage Controller - analysis and operation Snubbers - turn on, turn off, snubbers - RCD snubber Power Electronic Converters, Vector Control/Direct control /Torque Control of Motors, Simulation of PE systems, DSP Applications, Permanent Magnet Machines and Special Machines.

Control Systems & Instrumentation: Representation of continuous and discrete-time signals, shifting and scaling operations, linear, time invariant and causal systems, Fourier series representation of

continuous periodic signals, sampling theorem, Principles of feedback, transfer function, block diagrams, steady -state errors, Routh and Niquist techniques, Bode plots, root loci,lag, lead and lead-lag compensation, state space model, state transition matrix, controllability and observability, Bridges and potentiometers, PMMC, moving iron, dynamometer and induction type instruments, measurement of voltage, current, power, energy and power factor, digital voltmeters and multimeters, phase, time and frequency measurement, Q-meters, oscilloscopes, potentiometric recorders, error analysis.

Analog and Digital Electronics: Characteristics of diodes, BJT, FET, amplifiers -biasing, equivalent circuit and frequency response, oscillators and feedback amplifiers, operational amplifiers-characteristics and applications, simple active filters, VCOs and timers,combinationaland sequential logic circuits, multiplexer, Schmitt trigger, multi-vibrators, sample and hold circuits,A/D and D/A converters, 8-bitmicroprocessor basics, architecture, programming and interfacing. Semiconductor power diodes, transistors, hyristors, triacs, GTOs, MOSFETs and IGBTs,Converter.

ELECTRONICS & TELECOMMUNICATION ENGG

Module-1

Linear Wave Shaping Circuits, Hall effects, Rectifiers, Clippers, Clampers, Semiconductor technology, Small Signals Modeling of BJT, MOSFETs, Feedback Amplifiers & Oscillators, OP-Amps, Current Source Circuits, BJT and JFET Frequency Response, Power Amplifiers(A, B, C types), Distortion analysis, Push-pull configuration, Transients, Resonance, Network theorems, Network Functions: Poles And Zeros, Stability of Networks, Two-Port Parameters, Positive Real Function, Driving-Point Synthesis With LC Elements, Two Terminal-Pair Synthesis By Lader Development Gate level Minimization, K Map, POS, SOP, Combinational Circuits, Sequential Circuits, Memory & Programmable Logic, Digital Integrated logic Circuits, State machine Active filter design, Instrumentation Amplifier, Wideband amplifiers, Bistable Multivibrator, Schmitt trigger Circuit, Monostable Multivibrator, Tunnel diode & UJT, VCO, PLL Spectral Analysis, Power Spectral Density, AM, DSB-SC, SSB-SCand VSB, M, PM, Preemphasis and Deemphasis, Noise in AM & FM

Module-II

Anti-aliasing Filter, PAM, PWM, PPM, PCM, DPCM, DM, ADM, Line Coding**,** ISI, Equalizer, Eye diagram, Timing Jitter, White Noise, BPSK, BFSK, DE-PSK, QPSK, MSK, M-ary PSK, M-ary FSK Co-ordinate transformation, Electrostatics, Magnetostatics, Steady Electric Currents, Maxwall's Equations, Helmholtz wave equation. Plane wave solution, Polarization of EM wave, Radio Wave Propagation CMOS p-Well and n-Well Processes, CMOS Inverter, Layout of an Inverter, Combinational & Sequential Logic Circuits in VLSI, Semiconductor Memories, Design Capture Tools, VHDL, Testing and Verification LTI System, z-transform DFT, IDFT, FFT,DIT & DIF algorithms, Convolution, Correlation, FIR & IIR FiltersIntel 8085 Microprocessor, Memory Interfacing, Stack &Subroutines, Interrupts,8253, 8255, 8257, 8259, Intel 8086, Intel 80386 and 80486

Module-III

DC & AC bridges, True- RMS responding meter, Storage Oscilloscope, Sampling Oscilloscope, Sweep frequency Generator, Spectrum Analyzer, Strain Gages, Displacement Transducers, Instrumentation Amplifier, Isolation Amplifier, IEEE-488 GPIB Bus High Frequency Transmission line and Wave guides, Smith chart, Field solution for TE and TM modes, Cylindrical waveguides, Microwave Resonator, Power divider and Directional Couplers, Reflex Klystron, Multi-Cavity Magnetron, Microwave Propagation 8051 Microcontroller, Arithmetic Instructions and Programs, Single- Bit Instructions And Programming, Interfacing of 8051

Module-IV

Optical Fiber Modes and Configurations, Attenuation and Distortion in optical Fibers, LED and LASER Diodes, Optical Fiber System Link Budget

Satellite Orbits, Spacing and Frequency Allocation, Satellite Sub-systems, Satellite System Link Models, Direct Broadcast Satellite Services, Application of LEO, MEO and GEO Satellites

Image Digitization, Image Enhancement, Restoration, Compression,Segmentation, Processing of color images Methods for Speech Processing, Digital Representation of speech Waveform, Linear Predictive Speech Coding Block codes, Waveform coding, Cyclic Codes, Convolutional Encoding, Fuzzy Logic , Neural Networks, Evolutionary Computing Radar Equation, Radar Block Diagram, Radar Frequencies, Applications and Limitations of Radar TV Transmitters & its Block Diagram, Resolution, Scanning, Resolution, Sync Signal Cellular Concept & System Design, Mobile Radio Propagation, DS-SS and FH-SS, GSM, CDMA Antenna Basics & Fundamentals, Horn Antenna, Aperture Antenna, Dipole antenna, Yagi antenna.

COMPUTER SCIENCE & ENGINEERING
&
INFORMATION TECHNOLOGY

Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).
Computer Organization and Architecture: Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.
Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary
Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and- conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching.
Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes – P, NP, NP-hard, NP-complete.
Theory of Computation: Regular languages and finite automata, Context free languages and Pushdown automata, Recursively enumerable sets and Turing machines, Undecidability.
Compiler Design: Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.
Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems,

Protection and security.
Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.
Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.
Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers.
Network security – basic concepts of public key and private key cryptography, digital signature, firewalls.

Web technologies: HTML, XML, basic concepts of

PRODUCTION ENGINEERING

Metal Casting:

It include topics- Casting processes – applications and types; patterns – materials and types; allowances; cores and moulds – materials, making and testing; casting techniques of cast iron, steels and nonferrous alloys and metals; solidification; design of casting, risering and gating; casting inspection, remedies and defects.

Metal Forming: Stress-strain relations in plastic and elastic deformation; concept of flow stress, deformation mechanisms;cold and hot working – forging, extrusion,rolling, wire and tube drawing; sheet metal working processes such as piercing,blanking, bending, deep drawing,embossing and coining; analysis of rolling, extrusion,forging and rod/wire drawing; metal working defects.

Metal Joining Processes:manual metal arc,TIG,MIG, plasma arc, submerged arc, thermit, electro slag, resistance,friction, forge and explosive welding;other joining processes – soldering, braze welding, brazing; inspection of welded joints, remedies and decfects; introduction to advanced welding processes – ultrasonic, laser beam; electron beam ;thermal cutting.

Machining and Machine Tool Operations: Basic machine tools; machining processes-turning, drilling, milling,boring, planing,shaping, gear cutting, broaching, thread production,grinding, lapping, honing, super finishing; mechanics of machining – geometry of cutting tools,cutting forces, chip formation and power requirements, selection of machining parameters; Merchant's analysis; tool materials, tool life and tool wire, economics of machining, thermal aspects of machining, machinability ,cutting fluids; principles and applications of nontraditional machining processes – AJM,USM, EDM,WJM and Wire cut LBM, EDM,EBM, CHM,PAM, ECM.

Tool Engineering:

fixtures and jigs – applications,principles and design; press tools – configuration, design of punch and die; principles of forging die design.

Metrology and Inspection: Fits,Limits and tolerances, selective assembly, interchangeability; linear and angular measurements by optical and mechanical methods, comparators; design of limit gauges; measurement of straightness, flatness, squareness , roundness and symmetry; surface finish measurement; inspection of gears and screw threads; alignment testing of machine tools.

Polymers and Composites: Introduction to composites and polymers; plastic processing – injection, blow molding and Compression, extrusion, calendaring and thermoforming; molding of composites.

Manufacturing Analysis: Sources of errors in manufacturing; tolerance analysis in manufacturing and assembly; process capability; process planning; comparison of production alternatives and parameter selection, time and cost analysis; manufacturing technologies – selection and strategies.

Computer Integrated Manufacturing: Basic concepts of CAM,CAD, CAPP, cellular manufacturing, NC, DNC,CNC, Robotics, CIM and FMS.

Operation Research: Linear programming – problem formulation, duality, simplex method and sensitivity analysis; assignment and transportaion models; constrained optimization and Lagrange multipliers; network flow models ,simple queuing models; dynamic programming; simulation – manufacturing applications;CPM and PERT, resource leveling, time-cost trade-off.

Quality Assurance and Reliabilitycosts and concepts, quality assurance; quality circles, statistical quality control, zero defects, acceptance sampling, total quality management, six sigma; ISO 9000; design of experiments – Taguchi method.vailability,Reliabilityand maintainability; distribution of failure and repair times; determination of MTTR and MTBF, system reliability determination; reliability models; preventive maintenance and replacement, total productive maintenance – applications and concepts.

PHYSICS

Mathematical Physics: Linear vector space; matrices; vector calculus; linear differential equations; elements of complex analysis; Laplace transforms, Fourier analysis, elementary ideas about tensors.
Classical Mechanics: Conservation laws; central forces, Kepler problem and planetary motion; collisions and scattering in laboratory and centre of mass frames; mechanics of system of particles; rigid body dynamics; moment of inertia tensor; noninertial frames and pseudo forces; variational principle; Lagrange's and Hamilton's formalisms; equation of motion, cyclic coordinates, Poisson bracket; periodic motion, small oscillations, normal modes; special theory of relativity – Lorentz transformations, relativistic kinematics, mass-energy equivalence.
Electromagnetic Theory: Solution of electrostatic and magnetostatic problems including boundary value problems; dielectrics and conductors; Biot-Savart's and Ampere's laws; Faraday's law; Maxwell's equations; scalar and vector potentials; Coulomb and Lorentz gauges; Electromagnetic waves and their reflection, refraction, interference, diffraction and polarization. Poynting vector, Poynting theorem, energy and momentum of electromagnetic waves; radiation from a moving charge.
Quantum Mechanics: Physical basis of quantum mechanics; uncertainty principle; Schrodinger equation; one, two and three dimensional potential problems; particle in a box, harmonic oscillator, hydrogen atom; linear vectors and operators in Hilbert space; angular momentum and spin; addition of angular momenta; time independent perturbation theory; elementary scattering theory.
Thermodynamics and Statistical Physics: Laws of thermodynamics; macrostates and microstates; phase space; probability ensembles; partition function, free energy, calculation of thermodynamic quantities; classical and quantum statistics; degenerate Fermi gas; black body radiation and Planck's distribution law; Bose-Einstein condensation; first and second order phase transitions, critical point.
Atomic and Molecular Physics: Spectra of one- and many-electron atoms; LS and jj coupling; hyperfine structure; Zeeman and Stark effects; electric dipole transitions and selection rules; X-ray spectra; rotational and vibrational spectra of diatomic molecules; electronic transition in diatomic molecules, Franck-Condon principle; Raman effect; NMR and ESR; lasers.
Solid State Physics: Elements of crystallography; diffraction methods for structure determination; bonding in solids; elastic properties of solids; defects in crystals; lattice vibrations and thermal properties of solids; free electron theory; band theory of solids; metals, semiconductors and insulators; transport properties; optical, dielectric and magnetic properties of solids; elements of superconductivity.
Nuclear and Particle Physics: Nuclear radii and charge distributions, nuclear binding energy, Electric and magnetic moments; nuclear models, liquid drop model – semi-empirical mass formula, Fermi gas model of nucleus, nuclear shell model; nuclear force and two nucleon problem; Alpha decay, Beta-decay, electromagnetic transitions in nuclei; Rutherford scattering, nuclear reactions, conservation laws; fission and fusion; particle accelerators and detectors; elementary particles, photons, baryons, mesons and leptons; quark model.
Electronics: Network analysis; semiconductor devices; Bipolar Junction Transistors, Field Effect Transistors, amplifier and oscillator circuits; operational amplifier, negative feedback circuits ,active filters and oscillators; rectifier circuits, regulated power supplies; basic digital logic circuits, sequential circuits.

CHEMISTRY

PHYSICAL CHEMISTRY

Structure: Quantum theory: principles and techniques; applications to a particle in a box,harmonic oscillator, rigid rotor and hydrogen atom; valence bond and molecular orbital theories,Hückel approximation; approximate techniques: variation and perturbation; symmetry, point groups; rotational, vibrational, electronic, NMR, and ESR spectroscopy

Equilibrium: Kinetic theory of gases; First law of thermodynamics, heat, energy, and work; second law of thermodynamics and entropy; third law and absolute entropy; free energy; partial molar quantities; ideal and non-ideal solutions; phase transformation: phase rule and phase diagrams – one, two, and three component systems; activity, activity coefficient, fugacity, and fugacity coefficient; chemical equilibrium, response of chemical equilibrium to temperature and pressure; colligative properties;

Kinetics: Rates of chemical reactions, temperature dependence of chemical reactions; elementary, consecutive, and parallel reactions; steady state approximation; theories of reaction rates – collision and transition state theory, relaxation kinetics, kinetics of photochemical reactions and free radical polymerization, homogeneous catalysis, adsorption isotherms and heterogeneous catalysis.

INORGANIC CHEMISTRY

Main group elements: General characteristics, allotropes, structure and reactions of simple and industrially important compounds: boranes, carboranes, silicones, silicates, boron nitride, borazines and phosphazenes. Hydrides, oxides and oxoacids of pnictogens (N, P), chalcogens (S, Se & Te) and halogens, xenon compounds, pseudo halogens and interhalogen compounds. Shapes of molecules and hard- soft acid base concept.

Transition Elements: General characteristics of d and f block elements; coordination chemistry: structure and isomerism, stability, theories of metal- ligand bonding (CFT and LFT), mechanisms of substitution and electron transfer reactions of coordination complexes. Electronic spectra and magnetic properties of transition metal complexes, lanthanides and actinides.

Instrumental methods of analysis: Atomic absorption and emission spectroscopy including ICP-AES, UV- visible spectrophotometry, NMR, mass, Mossbauer spectroscopy (Fe and Sn), ESR spectroscopy, chromatography including GC and HPLC and electro-analytical methods (Coulometry, cyclic voltammetry, polarography – amperometry, and ion selective electrodes).

ORGANIC CHEMISTRY

Stereochemistry: Chirality of organic molecules with or without chiral centres. Specification of configuration in compounds having one or more stereogeniccentres. Enantiotopic and diastereotopic atoms, groups and faces. Stereoselective and stereospecific synthesis. Conformational analysis of acyclic and cyclic compounds. Geometrical isomerism. Configurational and conformational effects on reactivity and selectivity/specificity.

Reaction mechanism: Methods of determining reaction mechanisms. Nucleophilic and electrophilic substitutions and additions to multiple bonds. Elimination reactions. Reactive intermediates- carbocations, carbanions, carbenes, nitrenes, arynes, free radicals. Molecular rearrangements involving electron deficient atoms.

Organic synthesis: Synthesis, reactions, mechanisms and selectivity involving the followingalkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids and their derivatives, halides, nitro compounds and amines. Use of compounds of Mg, Li, Cu, B and Si in organic synthesis. Concepts in multistep synthesis- retrosynthetic analysis, disconnections,
synthons, synthetic equivalents, reactivity umpolung, selectivity, protection and deprotection of functional groups.

Pericyclic reactions: Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlation, FMO and PMO treatments.

Photochemistry: Basic principles. Photochemistry of alkenes, carbonyl compounds, and arenes. Photooxidation and photoreduction. Di-π- methane rearrangement, Barton reaction.

Heterocyclic compounds: Structure, preparation, properties and reactions of furan, pyrrole, thiophene, pyridine, indole and their derivatives.

Biomolecules: Structure, properties and reactions of mono- and di-saccharides, physicochemical properties of amino acids, chemical synthesis of peptides, structural features of proteins, nucleic acids, steroids, terpenoids, carotenoids, and alkaloids.

Spectroscopy: Principles and applications of UV-visible, IR, NMR and Mass spectrometry in the determination of structures of organic molecules.

MATHEMATICS

Real Analysis

Axioms of Choice, Countability, Bolzano-Weiestrass theorem, Heine-Borel theorem, Convergence of sequences and series of real numbers, Tests of Convergence, Cauchy Test, Uniform continuity, Sequences and series of functions, Uniform convergence. Power series, Weiestrass approximation theorem, Differentiation, Reimann-Stieltjes Integration, Function of several variables, Differentiability, Inverse function theorem, Implicit function theorem, Constrained maxima and minima.

Complex Analysis

Analytic functions, Power Series, Exponential and trigonometric functions, Conformal mapping, Riemann-Stieltjes integral, Power Series representation of Analytic functions, The index of a closed curve, Cauchy's theorem for rectangle, Cauchy theorem for disc, Cauchy's integral formula, Liouville's theorem, Fundamental theorem of Algebra, Morera's theorem, Open mapping theorem, Zeros, Poles, Classification of Singularities, Laurent Series, Residues, The Maximum Modulus theorem.

Functional Analysis

L^p – spaces, Inequalities in L^p – spaces, Completeness of L^p, Normed linear spaces, inner product spaces examples, properties of Normed linear spaces and inner product spaces, Hilbert spaces, Examples, orthonormal sets, Gram-Schmidt orthonormalizations, Orthonormal polynomials, Orthonormal basis, Fourier Expansion, Hahn Banach Theorem, Baire's category theorem ,Open mapping Theorem ,Closed graph theorem, Uniform boundedness Principle.

Numerical Analysis

Root finding for non-linear equations, Lagrange and Newton interpolations, Interpolating polynomials using finite differences, Hermite interpolation, Piecewise and Spline interpolation, Numerical differentiation, Numerical integration, Numerical Solution of system of linear equations, Numerical solution of ordinary differential equation.

Linear Algebra

Vector spaces over fields, subspaces, bases and dimension, Systems of linear equations, matrices, rank, rank-nullity theorem, duality and transpose, Eigenvalues and eigenvectors, characteristic polynomials, minimal polynomials, Cayley-Hamilton Theorem, triangulation, diagonal-lization, rational canonical form, Jordan canonical form.

Modern Algebra

Groups, Subgroups, Normal Subgroups, Quotient groups, Homomorphism, Isomorphism, Cyclic groups, Permutation groups, Symmetric groups, Cayley's Theorem, Sylow theorem, Application of Sylow Theorem, Free Abelian groups, Free Groups, Vector Spaces, Subspaces, Quotient spaces, Linear independence, bases, Dimension, Projection, Algebra of matrices, Rank of a matrix, Characteristic roots and Vectors, Matrix representation of a linear transformation.

Ordinary Differential Equation

System of first order equations, Existence and Uniqueness theorems, Successive approximation Picard's Theorem, Non Uniqueness of solutions, Existence and uniqueness of solution of systems, Strum Liouville's Problem green's functions, Picard's theorem.

Partial Differential Equation

Classification of first order Partial differential equations, Pfaffian differential equations, Lagrange's method, Compatible systems, Charpit's method, Jacobi's method, Integral surfaces passing through a given curve, Monge cone, characteristic strip, Classification of Second order Partial Differential Equations., One dimensional Wave equation, Vibration of an infinite string, origin of the equation, D'Alembert's solution, Vibrations of a semi finite string, Vibrations of a string of finite length, Laplace equation , Boundary value problems, Maximum and minimum principles.

Measure Theory

Sigma Algebra of Sets, Borel sets of **R**, Lebesgue outer measure and its properties, Sigma Algebra of Measurable sets in **R** , Non-measurable sets, Lebesgue measure and its properties, Cantor set and its properties, Measurable functions, Simple functions, Integration of Nonnegative functions, Riemann and Lebesgue Integration, Monotone convergence theorem, Fatou's Lemma, and Dominated convergence theorem.

Topology

Bases, Subbases, Countability, closed sets, Limit Points, Continuous functions, Subspace topology, Product topology, and Quotient topology, Connectedness, Local connectedness, Path-connectedness, compact Spaces, compactness in metric spaces, locally compacts spaces, Regular and completely regular space, normal spaces.

Discrete Mathematical Structures

Permutation, Combination, Graphs: Basic terminology, Multi graph and Weighted graphs, Paths and circuits, Eulerian Paths and circuits, Hamiltonion Paths and circuits, Trees: Rooted trees, binary search trees, Spanning trees, Cut sets, Recurrence relations and recursive Algorithms, Boolean Algebras.

Linear Programming

Simplex Method, Primal and Dual Problem, Duality & Simplex method, Dual Simplex Method, Transportation Problem, Properties of transportation matrix, N-W corner rule, Vogel's approximation method, and Transportation algorithm, Assignment Problem, Two person zero sum games, Maxmin and Minmax principle.

ENGLISH

Concepts in Literature
Literature: culture, context, convention, its practice and relevance
Genres of literature: poetry, fiction, drama
Literary devices and literary forms
Ballad,Comedy,Elegy,Epic,Novel,Ode,Romance,Sonnet,Tragedy,Tragicomey, Short Story)
Classical and neo-classical critical theories
Classical Theory & Criticism, Aristotle's Poetics, Longinus' On the Sublime
Neoclassical theory and criticism
Samuel Johnson's "Preface" to Plays of William Shakespeare
Literature and Social history-I
Medieval Period**:** Feudalism and Role of the Church
Early Modern**:** Humanism and the English Renaissance and the Print Revolution
The Beginnings of Colonialism
The Enlightenment**:** Ideas of the Enlightenment & The Beginnings of Modern Democracy
Colonialism to Imperialism
The novel in 18^{th}-19^{th} Centuries
Daniel Defoe's Moll Flanders
Jane Austen's Persuasion
Emily Brontë's Wuthering Heights
Jonathan Swift's Gullive's Travels
Richardson Pamela
Theory- Romantic & Victorian theory & Criticism
Romantic Theory & Criticism
Wordsworth's 'Preface' to Lyrical Ballads (Second Edition)
Coleridge's Biographia Literaria (Chapter XIII)
Victorian Theory & Criticism
Arnold's "The Study of Poetry"
Modern Drama
Introduction to Modern Drama, George Bernard Shaw's Pygmalion, Modern Drama and the Absurd, Samuel Beckett's Waiting for Godot, Harold Pinter's The Birthday Party
Modern Poetry
Poetry in the Modern World
Yeats's "Sailing to Byzantium"
Eliot's The Waste Land
Auden's "In Memory of W.B.Yeats"
William Carlos Williams' "Autumn and All"
20^{th} Century Criticism
New Criticism
Literary Theory: A Composite View
Structuralism to Post-structuralism
Roland Barthes
Psychoanalysis and Jacques Lacan
Feminism

COMPUTER APPLICATION

(Syllabus for interview/test for admission to PhD programme in Computer Application)

Following are the broad areas under which the candidate appearing for Ph.D. entrance test will be examined. Topics covered in the books following each subject area, upto the postgraduate level comprises the syllabus for this test. Alternate books, references which cover the same topics may be used instead. Candidates are expected to have basic proficiency in programming. No specific programming language for the test is expected.

Subjects:

Computer Architecture: representation of numbers; Octal, Hexadecimal, and Binary 2's complement and 1's complement arithmetic, Floating point representation. Combinational Circuit Design, Sequential Circuit Design, Hardware and Microprogrammed processor design, Instruction formats, Addressing modes, Memory types and organization, interfacing peripheral devices, Interrupts.

Data Structures & Algorithms: Arrays, stacks, queues, lists, linked, trees, graphs priority queues, heaps, Binary tree, AVL tree, B-tree and Hash tables. Graphs: connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree. Spanning tree of a graph, Eccentricity of a vertex, radius and diameter of a graph. Hamiltonian, Eulerian graphs and Planar graphs. Sorting and Searching Algorithms, Binary Search, Analysis of Algorithms, Asymptotic notations – big oh, omega and theta. Average case analysis of simple programmes like finding of a maximum of n elements. Recursion and its systematic removal. Techniques for Designing Algorithms: Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound. NP-hard and NP-complete problems.

Programming language concepts and paradigms: Data types, Operators, expressions, Assignment. Flow of control-control structures, I/O statements, User-defined and built-in functions. Parameter passing. Language Design: Syntax and semantics of a programming language and related concepts. Programming Paradigm and related concepts: Imperative, Object-oriented. Functional Logic paradigms

Operating Systems Main functions of operating system, Multiprogramming multiprocessing and multitasking. Memory Management: Virtual memory, paging fragmentation. Concurrent Processing: Mutual exclusion. Critical regions, lock and unlock. Scheduling: CPU scheduling, I/O scheduling, Resource scheduling. Scheduling algorithms. Banker's algorithm for deadlock handling.

Database Concepts: ER diagrams, Data Models. Design of Relational Database, Normalisation, 1NF, 2NF, 3NF, BCNF and 4NF. Limitations of the normal forms. SQL and QBE, query Processing and Optimisation. Centralised and Distributed Database Security, Object Oriented Database Management Systems with RDBMS applications.

Computer Networks & Data Communication: Channel capacity. Transmission media twisted pair, coaxial cables, fibre-optic cables, wireless transmission–radio, microwave infrared and millimeter waves. Light wave transmission. Telephone–local loop, unit multiplexing, switching, narrowband ISDN, broadband ISDN, ATM. High speed LANS Cellular Radio. Communication satellites– geosynchronous and low-orbit. Analog and Digital Transmission, Asynchronous and Synchronous transmission Transmission media, Multiplexing and Concentration, Switching techniques, Polling. Topologies, Networking Devices, OSI Reference Model: Protocols for – Data link layer Network layer, and Transport layer; TCP/IP protocols, Network security, Network administration.

Theory of computation: Models of computation: Deterministic Finite Automation (DFA), Non-deterministic Finite Automaton (NFA), Regular languages, Equivalences of DFA and NFA, Equivalence of DFA/NFA and regular languages, minimizing the number of states of DFA. Non-regular languages, and Pumping lemma.

Context-free Grammars & Pushdown Automata (PDA): Deterministic Pushdown Automation (DPDA), Non-deterministic Pushdown Automation (NDPDA) Non-equivalence of DPDA and Non-deterministic Pushdown Automation (NDPDA). Context free grammar (CFG). Equivalence of PDA's ad CFG's: Ambiguity, Parse Representation of Derivations. Simplification of CFGs: Greibach Normal Form GNF and Chomsky Normal Form (CNF). Parsing techniques for parsing of general CEG Cook-Kassami-Younger (CKY) algorithm.

Turing Machine (TM): One tape, multitape. The notions of time and space complexity in terms of TM, Construction of TM for simple problems. Computational complexity, Non-computability and Examples of non-computable problems.

Hierarchy of languages: Grammars, Languages – types of grammars – type 0, type 1, type 2, type 3. The relationship between types of grammars, and finite machine Pushdown automation and Context Free Grammars. Lexical Analysis regular expressions and regular languages. Recursive and recursively-enumerable languages.

Compiler Design: Compiler structure, compiler construction tools, compilation phases, Context free grammars. Paring and parse trees. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom up parser – shift – reduce, operator precedence, and LR. Topdown parsers – left recursion and its removal. Recursive descent parser, Predictive parser, Intermediate code generation, Code generation, Code optimisation.

Artificial Intelligence:

Elements of Symbolic Logic: Propositional (Boolean) Logic, Predicate Logic, Well-formed-formulae (WFF), Deduction, Satsifiability and Tautology, Refutation method. Applications in problem solving. State space representation of problem. Search techniques: breadth-first, depth-first. A, A* Knowledge representation: Frames, scripts, semantic nets, production systems, Fuzzy Systems: Definition of a Fuzzy set, Fuzzy relation, Fuzzy function, Fuzzy reasoning Applications to problem solving.

Software Engineering:

System Development Life Cycle (SDLC): Steps, Water fall model, Prototypes, Spiral model. Software Metrics: Software Project Management. Software Design: System design, detailed design, function oriented design, object oriented design, user interface design. Design level metrics. Coding and testing: Testing level metrics, Software quality and reliability, Clean room Approach, software reengineering.