VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, ODISHA, BURLA

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No.VSSUT/ACD/96 Dated: 22.01.2016

N O T I C E

Sub : List of candidates short listed for Written Test and Interview for admission into Ph.D Programme Spring 2016.

This is for information of all concerned that the **Written Test and Interview of Ph.D Programme Spring 2016 shall be held from 03.02.2016 to 05.02.2016 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 the original documents as mentioned in the list of documents and one set of attested copy of the same specified in the notice for verification. The interview of the candidates who will qualify 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. 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 AM. No candidate will be allowed to appear the test after commencement of Written Test.

PROGRAMME

Date	Time of Written Test	Branch
03.02.2016	10.00 AM	i) Civil Engineering ii) Electrical Engineering iii) Metallurgy & Materials Engineering iv) Mathematics
04.02.2016	10.00 AM	i) Electronics & TC Engineering ii) Production Engineering iii) Chemistry iv) English
05.02.2016	10.00 AM	i) Mechanical Engineering ii) Computer Science & Engineering iii) Information Technology iv) Computer Application v) Physics

Civil Engineering (8)

Sl.No.	Roll No.	Name of the Candidate	Father's Name	Written Test/ Interview
1	CE 01	Sanghamitra Jena	Subash Chandra Jena	**Interview only**
2	CE 02	Nandita Behera	Ramesh Chandra Behera	Written Test & Interview
3	CE 03	Kandi Babu Rejendra Prasad Reddy	K.Mastan Reddy	Written Test & Interview
4	CE 04	Archana Dash	Suresh Kumar Dash	Written Test & Interview
5	CE 05	Jhunarani Ojha	Chaitanya Charan Ojha	**Interview only**
6	CE 06	Sandeep Samantary	Bhabagrahi Samantary	Written Test & Interview
7	CE 07	Marabathina Maheswara Rao	M. Subhrahmanyam	Written Test & Interview
8	CE 08	Sukhamaya Sarkar	Lalit Mohan Sarkar	Written Test & Interview

Mechanical Engineering (13)

1	ME 01	Raj Kishor Das	Udayanath Das	Written Test & Interview
2	ME 02	Amar Kumar Das	Kiran Kumar Das	Written Test & Interview
3	ME 03	Sushanta Kumar Pradhan	Gangadhar Pradhan	Written Test & Interview
4	ME 04	Chandrabhanu Malla	Lalit Kumar Malla	Written Test & Interview
5	ME 05	Sushant Kumar Sahu	Digambar Sahu	Written Test & Interview
6	ME 06	Satchidananda Ghosh	Harihar Ghosh	Written Test & Interview
7	ME 07	Deepak Kumar Mohapatra	Bijay Kumar Mohapatra	Written Test & Interview
8	ME 09	Sushanta Kumar Das	Late Shishir Kumar Das	Written Test & Interview
9	ME 10	Satchidananda Tripathy	Karunakar Tripathy	**Interview only**
10	ME 11	Ipsita Nayak	Muralidhar Nayak	**Interview only**
11	ME 12	Manas Kumar Samal	Mana Mohan Samal	Written Test & Interview
12	ME 13	Kanhaiya Prasad	Mithilesh Panday	Written Test & Interview
13	ME 14	Ajit Kumar Behera	Prahallad Behera	**Interview only**

Electrical Engineering (22)

1	EE 01	Nanda Kishore Ray	Benimadhab Ray	Written Test & Interview
2	EE 02	Debashis Sitikantha	Tribikram Sahoo	Written Test & Interview
3	EE 03	Anwesha Biswas	Arun Biswas	Written Test & Interview
4	EE 04	Srikant Misra	Sripati Mishra	Written Test & Interview
5	EE 05	Sushila Behera	Dr. Harekrushna Behera	Written Test & Interview
6	EE 06	Chandan Kumar Barik	Dolagovind Barik	Written Test & Interview
7	EE 07	Sanjeeb Kumar Mishra	Subash Chandra Mishra	Written Test & Interview
8	EE 08	Prajnadipta Sahoo	Jaladhar Sahoo	Written Test & Interview
9	EE 09	Bishnu Charan Samal	Bipra Mohan Samal	Written Test & Interview
10	EE 10	Prakash Chandra Sahu	Banamali Sahu	Written Test & Interview
11	EE 11	Bibek Gantayat	Bhramarbar Gantayat	Written Test & Interview
12	EE 12	Priyanka Bahinipati	Bijaya Chandra Bahinipati	Written Test & Interview
13	EE 13	Nutan Saha	Satrughan Lal Saha	**Interview only**
14	EE 14	Prajna Pragatika Bhuyan	Pravat Bhuyan	Written Test & Interview
15	EE 15	Srinivasa Acharya	Sudhakara Acharya	Written Test & Interview
16	EE 16	Subham Pradhan	Krushna Chandra Pradhan	**Interview only**
17	EE 17	Kumarswamy Simhadri	Krishna Murthy	Written Test & Interview
18	EE 18	Srikanta Kumar Rath	Pradipta Kishore Rath	**Interview only**
19	EE 19	Chintu Jaganmohana Rao	Chintu Narasimhulu	Written Test & Interview
20	EE 20	Prasanta Kumar Pradhan	Late Kasta Charan	Written Test & Interview
21	EE 21	Tulasi Rama Krishna Rao	B. Naga Raju	Written Test & Interview
22	EE 22	Mamun Mishra	Birendra Kumar Mishra	**Interview only**

Electronics & Telecommunication Engineering (15)

Sl.No.	Roll No.	Name of the Candidate	Father's Name	Written Test/ Interview
1	ETC 01	Binapani Sethi	Hiralal Sethi	**Interview only**
2	ETC 02	Swastika Mishra	Sashi Bhusan Mishra	Written Test & Interview
3	ETC 03	Murali Krishna Bonthu	Jaya Sankar Rao	Written Test & Interview
4	ETC 04	Soumya Ranjan Mishra	Narahari Mishra	Written Test & Interview
5	ETC 06	Asit Kumar Mishra	Ramesh Chandra Mishra	Written Test & Interview
6	ETC 07	Premananda Mishra	Balaram Mishra	Written Test & Interview
7	ETC 08	Gyanaprava Mishra	Harekrushna Mishra	Written Test & Interview
8	ETC 09	Bibhudatta Mahapatra	Late Madan Mohan Mahapatra	Written Test & Interview
9	ETC 10	Madhusudan Maiti	Sadananda Maiti	**Interview Only**
10	ETC 11	Srikant Kumar Mohanty	Banshidhar Mohanty	**Interview Only**
11	ETC 12	Sanjay Kumar Ray	Ajaya Kumar Ray	Written Test & Interview
12	ETC 13	Bhagaban Kumar Behera	Dr. Narasingha Behera	Written Test & Interview
13	ETC 14	Manas Ranjan Sethi	Kailash Chandra Sethi	**Interview Only**
14	ETC 15	Salil Kumar Malla	Krushna Chandra Malla	Written Test & Interview
15	ETC 16	Sachin Anil Sonawane	Anil Ramakant Wani	Written Test & Interview

Computer Science & Engineering (22)

1	CSE 01	Raj Kumar Mohanta	Rati Kanta Mohanta	Written Test & Interview
2	CSE 02	Santi Kumari Behera	Hari Hara Behera	**Interview Only**
3	CSE 03	Trilochan Rout	Muralidhar Rout	Written Test & Interview
4	CSE 04	Debasish Nayak	Banamait Nayak	Written Test & Interview
5	CSE 05	Sanket Mishra	Dr. Rabiprasad Mishra	Written Test & Interview
6	CSE 06	Sanjib Kumar Raul	Bhanu Charan Raul	Written Test & Interview
7	CSE 07	Radha Mohan Pattanayak	Satya Narayan Pattanayak	Written Test & Interview
8	CSE 08	Udawant Prashant	Pralahad Rao	Written Test & Interview
9	CSE 11	Sushree Adyasha Pattanaik	Nishith Kumar Pattanaik	Written Test & Interview
10	CSE 12	PVVS Srinivas	P.Appa Rao	**Interview Only**
11	CSE 14	Biswaranjan Das	Sangram Keshari Das	Written Test & Interview
12	CSE 15	Lalit Mohan Ray	Narahari Ray	Written Test & Interview
13	CSE 16	Susanta Kumar Satpathy	Subash Chandra Satpathy	Written Test & Interview
14	CSE 17	Eadala Satish Reddy	E.Saibaba Reddy	Written Test & Interview
15	CSE 18	Asif Uddin Khan	Ajim uddin Khan	**Interview Only**
16	CSE 19	Appala Swamy Basana	Koteeswararao	Written Test & Interview
17	CSE 20	Saroj Kanta Misra	Maguni Misra	Written Test & Interview
18	CSE 21	Srikant Kumar Mohanty	Banshidhar Mohanty	**Interview Only**
19	CSE 22	Bandita Sahu	Japani Sahu	**Interview Only**
20	CSE 23	Suvendu Sekhar Dash	Narahari Dash	Written Test & Interview
21	CSE 24	Rakesh Roshan Patra	Prahallada Patra	**Interview Only**
22	CSE 25	Ashish Kumar Luha	Alekh Bihari Luha	**Interview Only**

Information Technology (2)

1	IT 02	Sanjib Kumar Raul	Bhanu Charan Raul	Written Test & Interview
2	IT 06	Shila Samantaray	Sarat Kumar Bal	Written Test & Interview

Production Engineering (4)

Sl.No.	Roll No.	Name of the Candidate	Father's Name	Written Test/ Interview
1	PE 01	Sudipta Chand	Durga Charan Chand	Written Test & Interview
2	PE 02	Braja Mohan Hembram	Dhanu Hembram	Written Test & Interview
3	PE 03	Bishnu Prasad Mishra	Ramesh Chandra Mishra	**Interview only**
4	PE 06	Harish Chandra Dalai	Pandab Charan Dalai	Written Test & Interview

Computer Application (9)

1	CA 01	Samaptika Panda	Aswini Kumar Panda	Written Test & Interview
2	CA 03	Mrs Sasmita Pradhan	Prafulla Kumar Pradhan	Written Test & Interview
3	CA 04	Subhashree Rout	Arjun Rout	Written Test & Interview
4	CA 05	Ashis Behera	Keshab Chandra Behera	Written Test & Interview
5	CA 06	Abadhan Ranganath	Abadhan Mardaraj Behera	Written Test & Interview
6	CA 07	Mrs Anchal Kumawat	Mahavir Kumawat	Written Test & Interview
7	CA 08	Chandra Sekhar Bhosagar	Ranjeet Bhosagar	Written Test & Interview
8	CA 09	Killi Chandra Bhushana Rao	Late K.Simhachalam	Written Test & Interview
9	CA 10	Dhruba Charan Pradhan	Anakula Pradhan	Written Test & Interview

Metallurgy and Materials Engineering (3)

1	MME 01	Tarini Sankar Acharya	Prasanta Kumar Acharya	Written Test & Interview
2	MME 02	Nilakantha Sahu	Bahadur Sahu	**Interview Only**
3	MME 03	Darshan Kumar Singh	Late Shri Anil Kumar Singh	Written Test & Interview

Physics (9)

1	PH 01	Bibhuti Bhusan Sahu	Raghumani Sahu	Written Test & Interview
2	PH 02	Pranati Dash	Padmanav Dash	Written Test & Interview
3	PH 03	Syamashree Roy	Gopal Prasad Roy	Written Test & Interview
4	PH 04	Sakti Prasad Mishra	Sudhir Kumar Mishra	Written Test & Interview
5	PH 05	Kshitibhusan Biswal	Late Digreelal Biswal	Written Test & Interview
6	PH 06	Karubaki Pattnaik	Tapan Kumar Pattanaik	Written Test & Interview
7	PH 07	Nishoriya Tanweer	Tanweer Wahab	Written Test & Interview
8	PH 08	Sankar Kumar Behera	Gopal Krishna Behera	Written Test & Interview
9	PH 09	Madhusmita Sahu	Shanta Kumar Sahu	Written Test & Interview

Mathematics (9)

1	MATH 01	Boina Anil Kumar	Boina Rama Rao	Written Test & Interview
2	MATH 02	Arun Kumar Patra	Late Kashinath Patra	Written Test & Interview
3	MATH 03	Balaram Sahu	Batakrishna Sahu	Written Test & Interview
4	MATH 04	Bhagwat Ram	Nathuni Ram	**Interview Only**
5	MATH 05	Hrushikesh Jena	Damodar Jena	Written Test & Interview
6	MATH 06	Suresh Chandra Mahapatra	Subal Chandra Mahapatra	Written Test & Interview
7	MATH 07	Deepak Kumar Nayak	Dibakar Nayak	Written Test & Interview
8	MATH 08	Madhusudan Patro	Rajib Lochana Patro	Written Test & Interview
9	MATH 09	Pravat Malik	Prafulla Kumar Mallick	Written Test & Interview

Chemistry (14)

Sl.No.	Roll No.	Name of the Candidate	Father's Name	Written Test/ Interview
1	CH 01	Adrushya Jyoti Pattanayak	Dukhisyam Pattanayak	Written Test & Interview
2	CH 02	Amrita Pritam Sahoo	Umes Kumar Sahoo	Written Test & Interview
3	CH 03	Sashi Bhusana Mahapatra	Sadananda Mahapatra	Written Test & Interview
4	CH 04	Prajna Paramita Acharya	Kishor Mohan Acharya	Written Test & Interview
5	CH 05	Sasmita Mahanta	Suresh Chandra Mahanta	Written Test & Interview
6	CH 06	Sarita Sahu	Sudarsan Sahu	Written Test & Interview
7	CH 07	Pritijyotsna Mohapatra	Nilamani Mohapatra	Written Test & Interview
8	CH 08	Prabhabit Raj	Pradeep Kumar Raj	Written Test & Interview
9	CH 09	Sashi Kanta Mohapatra	Anadi Charan Mohapatra	Written Test & Interview
10	CH 10	Balaram Nayak	Narendra Nayak	Written Test & Interview
11	CH 11	Monali Mishra	Rabi Narayan Mishra	Written Test & Interview
12	CH 12	Bhargabi Shur	Late Prafulla Kumar Shur	Written Test & Interview
13	CH 13	Soumy Ranjan Kar	Sushil Kumar Kar	Written Test & Interview
14	CH 14	Sonam Mishra	Debadutta Mishra	Written Test & Interview

English (5)

1	ENG 02	Shishir Barik	Purna Chandra Barik	Written Test & Interview
2	ENG 03	Bikram Keshari Rout	Rama Chandra Rout	Written Test & Interview
3	ENG 04	Jaydev Kar	Niranjan Kar	Written Test & Interview
4	ENG 05	Bandana Kar	Niranjan Kar	Written Test & Interview
5	ENG 06	Chitralekha Bhoi	Manbodh Bhoi	Written Test & Interview

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./B.E/B.Sc.(Engg.)/MCA/M.Sc. Examination
6	Pass Certificate of M.Tech./M.E/M.Sc.(Engg.)/M.Phil/M.A/MBA Examination
7	Memorandum of Marks of HSC Examination or equivalent Examination
8	Memorandum of Marks of +2 Science/Diploma Examination
9	Memorandum of Marks of +3 Science Examination
10	Memorandum of Marks of B.Tech./B.E/B.Sc.(Engg.)/MCA/M.Sc. Examination
11	Memorandum of Marks of M.Tech./M.E/M.Sc.(Engg.)/M.Phil/M.A/MBA Examination
12	Certificate in support of SC/ST category as the case may be
13	Original GATE/NET/Inspired Fellowship/ Letter of any fellowship from Government Agencies

Sd/- Dean, PGS & R

Memo No.VSSUT/ACD/97(20) Dated : 22.01.2016

Copy to :

1. All HODs for information and necessary action
2. Convener, Ph.D Admission Spring 2016 for information and necessary action.
3. Dean, Faculty & Planning with a request to display the notice in University website
4. PA to V.C for kind information of Hon'ble Vice-Chancellor

Dean, PGS & R

SYLLABUS

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

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, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials: Stress and strain, stress-strain relationship and elastic constants, 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; strain energy methods; thermal stresses.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

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

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, spur gears, rolling and sliding contact bearings, brakes and clutches.

Fluid Mechanics and Thermal Sciences

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

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. irreversibility and availability; behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

Applications: Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes. Turbomachinery: Pelton-wheel, Francis and Kaplan turbines - impulse and reaction principles, velocity diagrams.

Manufacturing and Industrial Engineering.

Engineering Materials: Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.

Metal Casting: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.

Forming: 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.

Joining: Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.

Machining and Machine Tool Operations: Mechanics of machining, 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, principles of 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 and probabilistic models; safety stock inventory control systems.

Operations Research: Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing 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

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

Digital Logic: Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Computer Organization and Architecture: Machine instructions and addressing modes. ALU, data path and control unit. Instruction
pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Programming and Data Structures: Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Algorithms: Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide and conquer. Graph search, minimum spanning trees, shortest paths.

Theory of Computation: Regular expressions and finite automata. Context free grammars and push down automata. Regular and contex
free languages, pumping lemma. Turing machines and undecidability.

Compiler Design: Lexical analysis, parsing, syntax directed translation. Runtime environments. Intermediate code generation.

Operating System : Processes, threads, inter-process communication, concurrency and synchronization.

Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

Databases:ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Computer Networks: Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key
cryptography, digital signatures and certificates, firewalls.

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.

Metallurgy & Materials Engineering

Structure: Atomic structure and bonding in materials. Crystal structure of materials, crystal systems, unit cells and space lattices, determination of structures of simple crystals by x-ray diffraction, miller indices of planes and directions, packing geometry in metallic, ionic and covalent solids. Concept of amorphous, single and polycrystalline structures and their effect on properties of materials. Crystal growth techniques. Imperfections in crystalline solids and their role in influencing various properties

Diffusion: Fick's laws and application of diffusion in sintering, doping of semiconductors and surface hardening of metals.

Metals and Alloys: Solid solutions, solubility limit, phase rule, binary phase diagrams, intermediate phases, intermetallic compounds, iron-iron carbide phase diagram, heat treatment of steels, cold, hot working of metals, recovery, recrystallization and grain growth. Microstructure, properties and applications of ferrous and non-ferrous alloys

Ceramics: Structure, properties, processing and applications of traditional and advanced ceramics.

Polymers: Classification, polymerization, structure and properties, additives for polymer products, processing and applications.

Composites: Properties and applications of various composites.

Advanced Materials and Tools: Smart materials, exhibiting ferroelectric, piezoelectric, optoelectric, semiconducting behavior, lasers and optical fibers, photoconductivity and superconductivity, nanomaterials – synthesis, properties and applications, biomaterials, superalloys, shape memory alloys. Materials characterization techniques such as, scanning electron microscopy, transmission electron microscopy, atomic force microscopy, scanning tunneling microscopy, atomic absorption spectroscopy, differential scanning calorimetry

Mechanical Properties: stress-strain diagrams of metallic, ceramic and polymeric materials, modulus of elasticity, yield strength, tensile strength, toughness, elongation, plastic deformation, viscoelasticity, hardness, impact strength, creep, fatigue, ductile and brittle fracture.

Thermal Properties: Heat capacity, thermal conductivity, thermal expansion of materials.

Electronic Properties: Concept of energy band diagram for materials – conductors, semiconductors and insulators, electrical conductivity – effect of temperature on conductivity, intrinsic and extrinsic semiconductors, dielectric properties.

Optical Properties: Reflection, refraction, absorption and transmission of electromagnetic radiation in solids.

Magnetic Properties: Origin of magnetism in metallic and ceramic materials, paramagnetism, diamagnetism, anti ferro magnetism, ferromagnetism, ferrimagnetism, magnetic hysterisis.

Environmental Degradation: Corrosion and oxidation of materials, prevention.

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 18th-19th 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' "Spring and All"
20th 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.