CIRCULAR

Sub: Syllabus/pattern for the admission of Ph.D./M.S. programmes in January 2014 session

Selection of the candidates will be based on the following criteria
a) 50 marks for the Written test
b) 20 marks for the Interview
c) 20 marks for the Qualifying degree
d) 5 marks for the Experience @ 1 mark for every 2 Years after PG degree
e) 5 marks for Publication in Journal /Conference /Symposium @ 1 mark for each

Cut off mark for the selection is 50 out of 100

Written test and interview : 08.10.2013 (Tuesday) between 9.30 to 10.45am

Number of questions for Test : 50

Duration of the test : 75 min.

Test and interview will be conducted in the University Department/Centre at CEG/ACT/MIT/SAP Campuses of Anna University, Chennai. Interview will be held on the same day or may be extended to the next day, if the number of candidates is more.

Candidates qualified in GATE, NET/SLET/other National Level Eligibility Test or INSPIRE Fellowship of DST, Rajiv Gandhi and Maulana Azad Fellowships of UGC or similar Fellowships awarded by statutory bodies of Govt. of India are exempted from written test and have to appear for interview only.

Candidate has to appear for test and interview in the respective Department/Centre based on their qualifying PG degree for Ph.D. and UG degree for M.S. Separate call letter for written test and interview will be sent by the convenor of the selection committee. No TA/DA will be paid for attending written test and interview.

Syllabus for the written test is given below.

SELECTION LIST WILL BE POSTED IN THE WEBSITE DURING NOVEMBER 2013.

Sd/-
DIRECTOR (RESEARCH)
Syllabus for the admission of Ph.D./M.S. programmes for January 2014

M.S. (By Research) in Civil Engineering


Urban / Transportation Engineering


Structural Engineering


Construction Engineering/Management

Formwork - Planning, Site equipment and plant for form work, Pressures on Forms, Design of forms and shores, Forms for domes and tunnels, Slip forms and Scaffolds.

Soil Mechanics and Foundation Engineering/ Rock Engineering And Underground Structures

Environmental Engineering
Environmental chemistry-aquatic chemistry, atmospheric chemistry, soil chemistry-environmental chemicals; Environmental Microbiology - classification and characteristics of Microorganisms-microbes and nutrient cycles- metabolism of microorganisms- pathogens in wastewater- toxicology Fluid flow-continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, minor heads losses- Planning of water system – selection of pipe materials, water transmission main design. Design of sanitary sewer; economics of sewer design-sewer appurtenances; material, construction, inspection and maintenance of sewers. Pollution in wastewaters – physical and chemical
Environmental Management

environmental management-environmental management system-Environmental audit

**Water Resources Engineering / Irrigation Water Management**


**Coastal Management/ Ocean Science and Technology**


**Geoinformatics/Remote Sensing**

**Urban Planning.**

**Mechanical Engineering/ CAD/CAM/Product/ Industrial Design**


**Energy /Thermal/Refrigeration and Air Conditioning/ Internal Combustion Engineering**


Manufacturing Systems Management/Lean Manufacturing/Project Management


Welding Engineering


Materials /Metallurgy Engineering

Diffusion in solids, , Strengthening Mechanisms, Phase diagrams, TTT diagrams, CCT diagrams, Heat Treatment of Ferrous and Non-ferrous materials, Surface Hardening, Different Casting Processes,

**Industrial Engineering**


**Quality Engineering & Management**


**Computer Integrated Manufacturing /Advanced Manufacturing Engineering**


**Printing and Packaging Technology**


**Mechatronics**


Production / Manufacturing Engineering


Aeronautical / Aerospace Engineering / Avionics


**Aerospace Technology**


**Avionics**

M.S.(By Research)


Automobile / Automotive Engineering


**Plastic/ Polymer Technology**


**Mining Engineering**


**Power Systems /Electrical and Electronics Engineering**


**High Voltage Engineering**


**Power Electronics and Drives /Electrical Machines**

**Embedded Systems Technology**


**Control System/ Instrumentation Engineering**

Measurements and Transduction: Principle of Transduction - Error and uncertainty analysis - Static and dynamic characteristics of sensors/Transducers - Resistive, capacitive, inductive, piezoelectric,

**VLSI Design /Applied Electronics Engineering**


**Medical Electronics/Biomedical Engineering**

Electronic Circuits, Semiconductor Devices, Integrated Circuits, Communication Theory Biomedical Instrumentation, Biomedical Equipments, Digital Image Processing, Radiological Equipments, Human Assist Devices

**Advanced/ Digital/ Optical / Wireless Communication/ Networking Technology/Communication Systems**


**M.S. (Research) in the ECE Depts**

Electronic Circuits, Semiconductor Devices, Integrated Circuits, Communication Theory
Computer Science and Engineering / Software Engineering / Information Technology / Pervasive Computing


Multimedia Technology


Master of Computer Applications (MCA)

Design, Coding, Testing and Maintenance, Metrics, Object Oriented Analysis and Design – Operating
Architecture: CPU – Main Memory – Control Unit – I/O Unit – Parallel Processing.

**Chemical / Petroleum Refining and Petrochemicals Engineering**

Process Calculations and Thermodynamics - Fluid Mechanics and Mechanical Operations - Heat
Transfer - Mass Transfer - Chemical Reaction Engineering - Instrumentation and Process Control - Plant
Design and Economics - Chemical Technology - Process Modeling

**Process Design**

Process Calculations and Thermodynamics - Fluid Mechanics and Mechanical Operations - Heat and
Mass Transfer - Chemical Reaction Engineering - Instrumentation and Process Control - Plant Design
and Economics - Chemical Technology - Process Plant Utilities - Chemical Process Design - Process
Modeling - Process Optimization

**Industrial Safety Engineering/Fire Engineering and Safety Management**

Probability and Reliability - random variable, special distributions, sampling, curve fitting, time series
analysis, reliability, computer programming and software, safety in chemical industry - concept of safety
and safety auditing, hazardous chemicals-precautions in handling, tolerance limits of industrial
emissions, carcinogens-health hazards of insecticides, drinking water standards - computer aided
hazards analysis, hazard, risk issues and hazard assessment, instrumentation, testing, risk analysis -
environmental pollution control and industrial hygiene, eia, impact assessment and documentation -
industrial safety and hazards management - fire and explosion, relief systems, toxicology, leaks and
leakages - process simulators - safety in engineering industry - metals and wood working machines,
guarding, welding and gas cutting, cold forming and hot working, finishing, inspection and testing -
regulations for health, safety and environment - safety management - construction - safety in material
handling - noise and vibration controls - electrical safety - air pollution control - fire and explosive
control and transport phenomena.

**Environmental Science and Technology**

Process Calculations and Thermodynamics - Fluid Mechanics and Mechanical Operations - Heat
Transfer - Mass Transfer - Chemical Reaction Engineering - Instrumentation and Process Control - Plant
Design and Economics - Chemical Technology. Environmental Science - Unit operations and processes
in Environmental Technology - Biological Wastewater Treatment - Separation Processes in Environmental Applications - Air Pollution Control - Solid and Hazardous Waste Management - Modeling of Environmental Systems

**Apparel Technology**


**Textile Technology**


**Ceramic Technology**


Leather Technology

**Footwear Science and Engineering**


**Biotechnology / Microbial/ Pharmaceutical Technology (with Technology)**

Cell Structure and Function of The Organelles - Cell Division and Connection - Transport Across Cell Membrane - Signal Transduction, Signal Amplification and Crosstalk - Classical Genetics - Sex Determination, Sex Linkage and Pedigree Analysis - Structure of Chromosomes and Variation In

Bio-Pharmaceutical Technology/ Industrial Pharmacy (with Technology)
Pharmacogenetics- pharmacogenomics in drug discovery and drug development.- Expressed sequence Tags (EST) and computational biology, Microbial genomics, computational analysis of whole genomes, computational genome analysis- Viability and ADR in drug response: contribution of genetic factor, Multiple inherited genetic factors influence the outcome of drug treatments - Target identification and validation, Drug candidate identification and optimization. Mutation of drug targets. Basic statistics for clinical trials; Clinical trials in practice; Reporting and reviewing clinical trials; Legislation and good clinical practice -International perspectives; Principles of the International Committee on Harmonisation (ICH)-GCP - Drug development and trial planning - pre-study requirements for clinical trials - Regulatory approvals for clinical trials - Legislative requirements for investigational medicinal products
- Project management in clinical trials - Application in clinical trial management; Risk assessment; Research ethics and Bioethics - Principles of research ethics; Ethical issues in clinical trials - animal ethics; Animal rights and use of animals in the advancement of medical technology; Introduction to laws and regulation regarding use of animals in research. Informed Consent and data protection-Data management – Introduction to trial master files and essential documents; Data management. Quality assurance and governance - quality control in clinical trials; Monitoring and audit; Inspections; Pharmacovigilance.

Biotechnology / Bio Engineering/ Molecular Biology/ Human Genetic/ Genomics / Biomedical Science/ Biochemistry (with M.Sc.)

Bioenergetics, Biochemical changes associated with biological processes; Enzyme kinetics and the role of enzymes in metabolism; Classification, biochemical properties, synthesis and metabolism of carbohydrates, proteins and lipids; Structural properties, synthesis and degradation of Nucleic acids. Microscopic examination and classification of microbes; Microbial growth and the medias used; Sterilization techniques; methods to control microbial population; Economical importance of microbes; Mendelian genetics; Sex determination; Disorders linked with chromosomal alterations, Mapping human genes. Cellular organization and functions of prokaryotic and eukaryotic cells; Cell cycle and regulation; Transport processes; DNA structure, Replication and repair; Transcription and translation in prokaryotes and eukaryotes and their regulation; Translation of mRNA in prokaryotes and eukaryotes. Cell signaling principles and the role of receptors in signal transduction; Signal amplification in Oncogenesis; Mutations and cancer; Viral mediated Oncogenesis; Cancer metastasis; Tumor markers and Cancer therapy. Units and abbreviations used in clinical Lab; Collection and preservation of biological samples; Biochemical tests performed for diagnosis; Organ function tests; Recombinant proteins and their clinical applications; Immunotherapy; Gene therapy; Stem Cell therapy. Fundamental
concepts of immunology; Immune responses generated by B and T lymphocytes; Antigen-Antibody interactions; Vaccines; Clinical immunology; Transplantation Immunology.

Microbiology/Botany/Zoology/Biochemistry

Botany

Photosynthesis - Emphasis on mechanisms of electron transport; photoprotective mechanisms; CO2 fixation-C3, C4 and CAM pathways. Respiration and photorespiration – Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternative oxidase; photorespiratory pathway. Nitrogen metabolism - Nitrate and ammonium assimilation; amino acid biosynthesis. Plant hormones – Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Sensory photobiology - Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks. Solute transport and photoassimilate translocation – uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates.

Zoology

Developmental biology, Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development. Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis. Ecology and Evolution. Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; The evolutionary synthesis.

Microbiology


Food Processing / Food And Nutritional Biotechnology

Food Chemistry – Composition of foods Nutrient and non-nutrient components of foods, water activity, lipid, carbohydrates, proteins, bioactive components, functional foods, analytical methods in food
analyses; food additives, their functions and applications - Food microbiology - microbial spoilage of foods, food pathogens, food poisoning, food borne infections, microbes in food fermentation. Bioreactor and upstream processing, fermentation processes – batch, continuous, fedbatch, enzymes in food technology, microbial productions of aminoacids, proteins, lipids, flavor components, colouring agents. Types of processing - aseptic processing, drying and ultrafiltration, canning, radiation processing, CAP, MAP, Hurdle technology, newer methods- ohmic heating PEF, High pressure processing, food packaging technology. Cereal, Pulse and oilseed technology, meat, fish and poultry technology, dairy product technology, fruit and vegetable technology, flavours, spices, coffee, tea, cocoa. Heat Transfer, mass transfer, fluid mechanics, mass and energy balance, mechanical operations Engineering materials, pumps, principles of refrigeration, Equipments used for milling, extrusion, mixing, blending, filling, heat processing and cooling. Sensory evaluation of foods, consumer testing, food product development, Assessment of food safety, GHP, GMP, HACCP, sanitation and hygiene in food industry, food safety management systems, ISO. GM foods, use of biotechnology in enhancing food production and safety assessment. Food Laws and regulations – National and international, Codex, JECFA, USFDA, EFSA, FFSAi, BIS. Food economics and Trade, public distribution, food security.

**Nano Science and Nano Technology**


**Digital/Landscape /General Architecture**

Evolution and principles of city planning; types of cities & new towns; planning regulations and building byelaws; eco-city concept; Concept of housing and neighborhood ; housing standards ,policies and typology , housing infrastructure; housing programs in India; self help housing, settlement system planning; growth of cities & metropolises; rural-urban migration; urban conservation; urban renewal; Traffic and Transportation Planning. Indian architecture from Indus civilization to Modern contemporary period. European architecture from Egyptian modern architectural styles to contemporary period. Vernacular and traditional architecture. Principles of landscape design and site planning; history of landscape styles, elements and materials, plant characteristics. environmental considerations in landscape planning. Application of computers in architecture and planning; understanding elements of hardware and software; computer graphics; programming languages and usage of software packages.
Components of Ecosystem and environment, climate responsive and energy efficient building design. Principles of Building Science –lighting, architectural acoustics etc. Building Services on Water supply, sewerage and drainage systems, electrification of buildings, air-conditioning intelligent buildings; fire fighting systems, building safety and security systems principles, types, standards and uses; Infrastructure, Services and Amenities in city level planning. Behavioral characteristics of all types of building materials ;principles of strength of materials; design of structural and principles of disaster resistant structures. Building Construction and Management: Building construction techniques, methods and details; professional practice; project management techniques. Development Administration and Management: Planning laws; development control and zoning regulations.

**Town and Country Planning**

Process of evolution of human settlement planning - Planning systems in India - Type of planning surveys - Sociological and Economic concepts and frameworks - Social and economic Impacts of urban growth and expansion - City-region, urban sprawl, and urban fringe - Current trends in the traffic and transportation development sector in India.- Pedestrian planning- Parking and Public Transport Surveys – Inventory of Transport facilities - Different modes – Private transport – Scope and function of statistics in planning analysis - Distribution and structure of population – Population projection methods - Research processes and planning processes - Access to Information: nature, types and sources - Hypothesis - Housing character and its information with reference to culture and technological changes and development -Impact of industrialization and urbanization on housing and built environment - Green house and eco friendly housing - Housing market and housing finance -Gated community-emergence and management system - Contemporary theories and concepts in city planning - Concept and need for regional planning and regional development – Multi-level planning, block and District planning. Environmental concerns at local, regional and global levels - environmental impact assessment practice in India - Sustainability and environmental - Legislative requirements, public awareness and community participation – Evolution, scope and significance of planning legislation - Review of Town and Country Planning Act of Tamil Nadu - Professional role responsibility and planning consultancy service - project cycle – Planning process and project planning – Funding options for urban development projects - Planning Norms and standards - Basic concepts of government and governance - Governance and urban governance - Urban and rural administration in developed, and developing countries - e-Governance-concepts, theories and practices - e-Readiness indices - Approaches to understanding organizations - Human resource planning and management – Participatory governance - Public relations- Introduction to real property ownership - Real estate investment analysis and portfolio management - Classification of
spatial and non-spatial data application of spatial data in urban and regional plans - Ecotourism - Leisure, recreation and society - Tourist and local community - Tourist site planning - processes and sustainability - Urban development through Five Year Plans - Budgetary allocation from central and state governments for urban development - Asset management - Disaster cycle - Disaster-types, causes and consequences - Disaster preparedness and rehabilitation - Spatial planning and technology interface - Socio-economic and environmental Impact of techno cities - communities and people in building smart cities and smart communities - Information need and the role of web in planning - Web sites and information sources in urban and regional planning.

**Electronic Media/ Journalism and Mass Communication/ Visual Communication**


**Mathematics**

Computer Science Information Technology (with M.Sc.)


Physics/Astrophysics


Laser and Electro Optical Engineering


Materials Science (with M.Sc)

**Medical Physics**

*Basic Radiation Physics:* Atomic Structure, radioisotopes, radioactivity, radioactive equilibrium, artificial radioactivity, production of radioisotopes. Interaction of charged particles with matter, Interaction of X- and gamma rays with matter attenuation, modes of interactions, attenuation and mass energy absorption coefficients, buildup correction, shielding materials. Interaction of neutrons with matter, scattering, absorption, neutron induced nuclear reactions, radioactive capture reactions \((n, p)\), \((n, \gamma)\), moderation, shielding materials. Basic X-ray Physics characteristics and continuous spectra, basic requirements of medical diagnostic and therapeutic tubes, safety devices in X-ray tubes, technology of modern X-ray tubes, insulation and cooling of X-ray tubes, filtration and beam quality, mobile and dental units, malfunctions of X-ray tubes, limitations on loading, control panels, image intensifiers; technology of electron accelerators. Radiation Quantities and Units: w-value, exposure (rate), Kerma (rate), Terma, absorbed dose (rate), activity, energy, rate constants, charged particle equilibrium (CPE), radiation weighting factors, tissue weighting factors, equivalent dose, effective dose, collective effective dose. Radiation Dosimetry: Absorbed dose, Kerma, exposure, activity, rate constants, Charged Particle. Equilibrium (CPE), relationship between Kerma, absorbed dose and exposure under CPE; determination of exposure and air kerma, ionization chambers for low, medium and high energy, X-rays and gamma rays, electrometers, determination of absorbed dose. Basic principles of radiation detection, Gas Filled detectors: Ionisation chambers- Theory and design; Construction of condenser type chambers; Radiochromic films; Thermoluminescent Dosimeters (TLD), Optically stimulated Luminescence dosimeters (OSLD), radiophotoluminescent dosimeters, neutron detectors, nuclear track emulsions for fast neutrons, solid state nuclear track (SSNTD) detectors, calorimeters. Radiation Measuring & Monitoring Instruments: Dosimeters based on condenser chambers, pocket chambers, dosimeters based on current measurement, different types of electrometers-MOSFET, farmer dosimeters, multipurpose dosimeter, water phantom dosimetry systems, brachytherapy dosimeters, Thermoluminescent dosimeter readers for medical applications, calibration and maintenance of dosimeters. Radiation Biology: mutations, potentially lethal and sub-lethal damages, modification of radiation damage, LET, RBE, dose rate, dose fractionation, stochastic and deterministic effects of radiation, acute radiation sickness, LD50/60, effects of radiation on skin, blood forming organs, digestive tract and reproductive system; effects of chronic and acute exposure to
radiation, induction of leukemia and radiation carcinogenesis. Nuclear Medicine Clinical radioisotope laboratory and its organization, use of open isotopes including 99Tc in functional studies, measurement of radioactivity, design aspects of collimators, use of whole body counters, physical principles of isotope dilution analysis, circulation time, radioisotope scanners and cameras, cyclotron produced radionuclides, SPECT, PET, radio-Immunoassay (RIA), therapy. Radiation Hazard Evaluation and Control. Radiation monitoring instruments, calibration check of monitoring instruments, radiation monitoring procedures for radiation generating equipment and installations, protective measures to reduce radiation exposures to patients and occupational workers, radiation hazards in radioisotope laboratories, protective equipment.

**Chemistry**


**Geology**


Agro Chemistry

Manufacture of Agrochemicals, Resource Management, Pesticide Biochemistry, Pesticides Formulations, Crop Pathology & Pest Management, Weed management, Modern Techniques in agriculture, Food processing, Dairy Technology, Advanced Agrochemicals, Biopesticides and Fertilizers

Agriculture (with M.Sc.)

History and Principles of Plant Pathology, Laboratory and Analytical Techniques, Physiological and Molecular Plant Pathology, Mycology, Plant Bacteriology, Plant Virology, Plant Disease Epidemiology,
Phanerogamic parasites and Non-parasitic Diseases, Fungal Diseases of Crop Plants, Bacterial and Viral Diseases of Crop Plants, Management of Plant diseases

**English/Linguistics**


**Master of Business Administration with any specialisation**