INSTITUTE OF SCIENCE AND TECHNOLOGY(Autonomous)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Kukatpally, Hyderabad., Andhra Pradesh.-500085

Technical Education Quality Improvement Programme , [TEQIP] PHASE – II

NOTIFICATION

ADMISSION TO FULL TIME Ph.D. RESEARCH PROGRAMMES (Under TEQIP-II)-2014

Advt. No. ISTJNTUH/Full Time Ph.D./TEQIP-II/2014 Dt: 22/03/2014

Applications are invited for admissions to the Full Time **Ph.D.** Research Programmes in major areas of Engineering/ Science at Institute of Science & Technology, JNTUH Hyderabad.

Areas of Research & Eligibility: The details of Areas of Research and eligibility are available on website **www.istjntuh.org**

Application form and other details can be downloaded from IST,JNTUH web site **www.istjntuh.org** Filled in application form with required certificates and a crossed Demand Draft for Rs. 1,000/- (non refundable) drawn in favour of **"The Director, JNTUH IST,TEQIP-II HYDERABAD"** payable at Hyderabad dated not earlier than **22.03.2014** drawn on any Scheduled Bank recognized by RBI should reach " **The Director, Admissions, JNTUH**, Kukatpally, Hyderabad - 500085 on or before **7th April, 2014 by 5.00 pm without fine and on or before 11th April 2014 with a fine of Rs 1000/-.**

DIRECTOR, IST,JNTUH

Last Date for Receipt of Applications :

i. **without fine :07/04/2014 by 5.00PM**

ii **with fine of Rs 1000/- :11/04/2014 by 5.00PM**

INSTITUTE OF SCIENCE & TECHNOLOGY
Jawaharlal Nehru Technological University Hyderabad.
Kukatpally, Hyderabad-500085, AP

APPLICATION FORM FOR ADMISSION TO
FULL TIME Ph.D. RESEARCH PROGRAMMES–2014 (UNDER TEQIP-II)

Details of Demand Draft for Full Time Research Programmes is Rs. 1,000/- in favour of **"THE DIRECTOR,JNTUH,IST,TEQIP-II. HYDERABAD"** payable at Hyderabad. Fee once paid will not be refunded.

D.D. No.	Date	Bank	Amount

If the candidate is qualified in NET/SLET(please put a **[√]** mark in the appropriate box) (Enclose qualified certificate)	NET	SLET	NO

Name of the Faculty (please put a [√] mark in the appropriate box) :

1	Biotechnology	[ ]
2	Chemical Engineering	[ ]
3	Environmental Science and Technology	[ ]
4	Nano Science & Technology	[ ]
5	Water Resources	[ ]
6	Spatial Information & technology	[ ]

Affix recent passport size photograph duly attested by Gazetted Officer with office seal.

1. Name (In block letters) : _____
2. Father's / Husband's Name : _____
3. Address :_____

   _____

   Phone / Mobile No. _____

   E-mail ID : _____

4. Gender (please put a [√] mark in the appropriate box)

Male	Female

5. Date of Birth (in DD/MM/YYYY)

Date	Month	Year

6. Category (please put a [√] mark in the appropriate box)

OC	BC-A	BC-B	BC-C	BC-D	BC-E	SC	ST

7. Details of Academic Qualifications : Starting from S.S.C. (Please enclose true copies of the Certificates).

Examination	Subject	College / School where studied	University / Board	Year of passing with Division	Aggregate Percentage

8. Declaration by the Candidate :

I shall abide by the Academic Regulations of the Institute of Science & Technology, JNTUH Hyderabad. The particulars furnished above are correct and complete.

Date :
Place :

SIGNATURE OF CANDIDATE

HALL TICKET **ORIGINAL**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD, A.P.
ENTRANCE TEST FOR ADMISSION FULL TIME PH.D. RESEARCH PROGRAMMES-2014
(UNDERTEQIP-II)

Faculty in which Admission for Ph.D. is sought:

Centre of Examination **: IST**,**JNTUH, Kukatpally, Hyderabad-500085.**

Hall Ticket No:

Date of Examination:
Time:

Affix recent passport size Photograph duly attested by Gazetted Officer with office seal.

(To be filled in by the candidate)

Name of the Candidate: _____

Father's/Husband's Name: _____

Identification Marks: (1) _____

(2) _____

Signature of Candidate

DIRECTOR, ADMISSIONS
JNT University Hyderabad

HALL TICKET **DUPLICATE**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD, A.P.
ENTRANCE TEST FOR ADMISSION FULL TIME PH.D. RESEARCH PROGRAMMES-2014
(UNDERTEQIP-II)

Faculty in which Admission for Ph.D. is sought:

Centre of Examination **:** : **IST**,**JNTUH, Kukatpally, Hyderabad-500085.**

Hall Ticket No:

Date of Examination:
Time:

Affix recent passport size Photograph duly attested by Gazetted Officer with office seal.

(To be filled in by the candidate)

Name of the Candidate: _____

Father's/Husband's Name: _____

Identification Marks: (1) _____

(2) _____

Signature of Candidate

DIRECTOR, ADMISSIONS
JNT University Hyderabad

INSTRUCTIONS WITH ORIGINAL HALL TICKET.

1. Candidates will not be admitted after the commencement of examination and not allowed to leave the hall until the end of the examination.
2. The Hall Ticket shall be produced at the time of examination, failing which the candidate will not be allowed to appear for the examination.
3. **Use HB pencil/Ball pointpen(Blue/black) only to darken the circles in the OMR Answer sheet**.
4. THE HALL TICKET SHALL BE PRESERVED TILL THE TIME OF ADMISSION- without which the candidate is not eligible for admission.
5. No travelling expenses will be paid for journey undertaken for appearing for the Entrance Examination.
6. Adoption of any kind of unfair means at the time of examination or taking part in any act of impersonation will render the applicant liable for cancellation of his/her script and forfeiture of his/her claim for appearing for the examination. Decision of the Chief Superintendent of the Examination Centre shall be final in these matters.
7. Issue of the Hall Ticket and appearance at the Entrance Examination does not automatically entitle a candidate for admission.
8. Mathematical Tables, Calculators, Pagers, Mobile Phones and any other electronic gadgets are not allowed in to the Examination Hall.

INSTITUTE OF SCIENCE AND TECHNOLOGY(Autonomous)
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Kukatpally, Hyderabad., Andhra Pradesh.-500085
Technical Education Quality Improvement Programme , [TEQIP] PHASE – II
Guidelines

Notification for Admission in to Ph.D Research Assistantship under TEQIP-II,IST, JNTUH.

METHODOLOGY OF RESEARCH

1. As per the UGC revised guidelines, a course work of one semester is compulsory. The course work includes

   i) Two subjects at P.G level with attendance and an examinations.
   ii) One subject "Research methodology" with compulsory attendance and internal auditing.

Apart from the course work, the Pre Ph.D examinations are also compulsory. The details of the evaluation procedure of Ph.D research work will available in JNTUH website.

II. ELIGIBILITY:

Educational Qualifications:

- Candidates must have a Post Graduate Degree in concerned disciplines with a minimum of 55 % marks in aggregate for general category and for SC / ST candidates the aggregate shall be 50%.
- MCA or M.Sc qualified candidates are not eligible for Ph.D. programmes in Engineering streams under TEQIP II.

SI NO	Discipline	Eligibility
1.	Biotechnology	Post Graduate Degree in Biotechnology / Chemical Engineering/Food Technology/ Bio Chemical Engineering/Bio Chemistry / Microbiology /Life Sciences (Zoology, Botany, Genetics, Agricultural Sciences) / Pharmacy / Environmental Science and Technology
2.	Chemical Engineering	Post Graduate Degree in concerned engineering discipline.
3.	Environmental Science and Technology	Postgraduate degree in Physical Sciences / NaturalSciences/LifeSciences/EnvironmentalSciences/Biotechnology/Environmental Engg. / Agricultural / Computer Sciences/Post Graduation in any Engineering
4.	Nano Science & Technology	Postgraduate degree in nano science and nano technology/M.Tech in Nano technology/ M.Tech in Materials Science /other Nano science and Nano technology any other Equivalent degrees
5.	Water Resources	Any Post Graduate degree in the field of Water Resources / Hydrology / Watershed Management / Geology / Geophysics / Geo-Engineering / Meteorology / Agricultural Engineering / Agricultural Meteorology / Soil Sciences (Water resources aspects and Agronomy
6.	Spatial Information & technology	Post Graduate Degree in Spatial Information Technology/Mathematics / Physics / Chemistry / Geology / Geography / Engineering /Agriculture / Atmospheric Sciences / Space Sciences.

III. NUMBER OF SEATS

S.No.	Disciplines	No. of Seats
1	Biotechnology	4
2	Chemical Engineering	4
3	Environmental Science and Technology	4
4	Nano Science & Technology	1
5	Water Resources	4
6	Spatial Information & technology	1
	Total	18

V. MODE OF SELECTION :

Selection will be based on Entrance Examination and Interview.

ENTRANCE EXAMINATION:

- An entrance examination will consists of 100 multiple choice questions.
- Duration of entrance examination is 2 hour.
- The minimum qualifying marks at the entrance examination is 40% for general category and for SC/ST category 25%.
- The entrance examination syllabus, subject wise is available in **www.istjntuh.org** web site.

- Last date of submission of duly filled in application is **7thApril 2014 without fine and is 11th April with fine, before 5.00pm**
- The list of eligible candidates for entrance examination with their Hall Ticket Numbers will be displayed in IST, JNTUH website **www. istjntuh.org and www.jntuh.ac.in**
- Candidates must collect their Hall Tickets from the Director, Admissions, JNT University Hyderabad (JNTUH), Kukatpally, Hyderabad, two days before the entrance examination between 10.00am to 5.00pm.The written examination is scheduled on **12th,13th,14th May 2014, from 11.00AM to 01.00PM & 2.00PM to 4:00PM. The schedule of the examination along with details of the faculty will be displayed on the website www.istjntuh.org and www.jntuh.ac.in.**
- Candidates who are appearing for more than one faculty must submit separate application along with registration fee.

Tentative Schedule of the Entrance Examination :

S.No.	Branch	Date	Time
1.	Chemical Engineering	12th May 2014	11.00 am to 01.00 pm
2.	Spatial Information & technology	12th May 2014	02.00 pm to 04.00 pm
3.	Water Resources	13th May 2014	11.00 am to 01.00 pm
4.	Biotechnology	13th May 2014	02.00 pm to 04.00 pm
5.	Nano Science & Technology	14th May 2014	11.00 am to 01.00 pm
6.	Environmental Science and Technology	14th May 2014	02.00pm to 04.00 pm

INTERVIEW:

- Interviews will be conducted for the candidates qualified in the Entrance examination, by JNTUH, Hyderabad.
- The Candidates who qualify the NET/SLET need not write the written test however they should get through in the interview process.

V. Candidates who are qualified in Entrance Test and NET/SLET qualified candidates must appear before the admission committee for an interview at JNTU Hyderabad at their own cost. The date and time of interview will be as displayed on ISTJNTUH website **www. istjntuh.org and www.jntuh.ac.in** No separate intimation will be made in this matter.

- The University reserves the right to cancel admission / registration of any candidate to the research programme at any stage if it is noticed that the data furnished / certificates enclosed are incorrect.

- In case of any disputes concerning admissions to the courses of IST, JNT University Hyderabad, the jurisdiction shall remain with the Courts or Consumer forum in Hyderabad only.

VI. RESEARCH ASSISTANTSHIP :

All the selected candidates are eligible for a Research Assistantship of Rs. 14,000/- + HRA under TEQIP-II project duration, ending by March 2015.

VII. FEE :

- On selection for admission, candidates shall be required to pay the prescribed admission fee Rs 200/-,Registration fee of Rs 20,000/-per annum and other admissible fee prescribed by the University for Research Programme. Thereafter the fee has to be paid every semester till the successful completion of the programme and submission of thesis or cancellation of the admission whichever the case may be.
- Details of fee payment particulars for Research programmes and evaluation procedure can be known from the Director, R & D Cell, JNTUH, Kukatpally, Hyderabad.

VIII GENERAL :

- Application complete in all respects (in A4 size) accompanied with a Demand Draft for 1000/- for Full Time Research Programmes, drawn in favour of **"DIRECTOR JNTUH IST TEQIP-II"** payable at Hyderabad on any nationalized banks.
- Filled in application along with demand draft, is to be submitted to **"The Director, ADMISSIONS,** JNTUH, Kukatpally, Hyderabad - 500 085" either in person or by Registered post / Courier on or before **7ththApril, 2014** by 5.00 pm without fine and **11th April 2014,by 5.00pm with a fine of Rs 1000/-** .
- The IST,JNTUH is not responsible for delay or loss of application in transit.
- Incomplete applications received after the last date will not be considered and fee paid will not be refunded.

DIRECTOR,IST JNTUH.

IST,JNTUH Full Time Ph.D. Programme Under TEQIP-II 2014-2015
Entrance Examination Syllabus
BIOTECHNOLOGY

1. **Introduction to Biotechnology:** Introduction to biotechnology Chronological development of industrial biotechnology, Range of biotechnology products.

2. **Chemical foundations of biology:** pH, pK, acids, bases, buffers, weak bonds and covalent bonds.

3. **Biochemistry:** Structure and functions of Carbohydrates, Lipids, Proteins, Amino acids and Nucleic acids.

4. **Separation techniques:** Electrophoretic and chromatographic techniques (Affinity, Ion-exchange, Gel filtration TLC and HPLC) for separation of different biomolecules.

5. **Enzymes:** Introduction to enzymes, kinetics, inhibition and allosteric enzymes.

6. **Microbiology :** Morphological, Structural and Biochemical characteristics of prokaryotes; Pure culture techniques; The definition of growth, mathematical expression of growth; Principles of microbial nutrition, construction of culture media; Culture collection and maintenance of cultures.

7. **Molecular biology:** DNA & RNA Structure, Replication: Transcription Translation; Recombination Plasmids, Transposable elements, TY Elements.

8. **Process engineering principles:** Role of process engineering principles in biotechnological industries, Brief overview of fundamentals of chemical engineering - concepts of unit operation & unit processes.

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IST,JNTUH Full Time Ph.D. Programme Under TEQIP-II 2014-2015
Entrance Examination Syllabus

SPATIAL INFORMATION TECHNOLOGY

I. DBMS and Geographical Information Systems:

- Spatial and Non-Spatial Data, Classification of GIS, Geographically referenced data, Georelational model.
- Data base system concepts – Relational model, Network model, Data base design and querying, ER model.
- Web fundamentals, Web interfaces to databases, Object oriented data base and XML, XML applications.
- Decision support systems, Data analysis and OLAP.
- Spatial data inputs – Vector data model, Vector data input, Attribute date input, Topology.
- Elements of raster model, Map design, Map scale, Choropleth map.
- Spatial interpolation, Thiessen polygon, Ordinary Krigging and Universal Krigging, Network and applications, Dynamic segmentation.
- Data for Terrain Mapping, DEM, TIN, Terrain Analysis.
- GPS data processing, DGPS principles, Errors and accuracy assessment.

II. Principles of Photogrammetry, Remote Sensing and Digital Image Processing:

- Characteristics of aerial photographs, Mapping with aerial photographs, Ground control, Relief displacement.
- Remote sensing satellites – IRS series, High resolution satellite and their spatial resolution, spectral resolution, spectral signatures, FCC, Microwave remote sensing principles.
- Thematic Applications to Agriculture, Environment, Urban sprawl, Forestry, Hydrology and Coastal and Marine studies.
- Image pre processing, Image enhancement – Low and high pass and band pass filters, Image filter, Contrast stretch, Band rations, Histogram equalization.
- Image classification – Supervised and Unsupervised Classification, Confusion matrix, Accuracy assessment, Classification of mixed pixels, Data merging and GIS.

Recommended Books:

1. Geographical Iinformation Systems – Dr. Kang-Rsung Chnag – Published by Tata Mcgraw Hill.
2. Database system concepts by A Silberschatz and HE Korth and S Sudershan – Published by Mcgraw Hill – International edition.
3. Remote Sensing and Image interpretation by TL Lillesand, R W Kiefer, J W Chipman – Published by Wiley International.

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IST,JNTUH Full Time Ph.D. Programme Under TEQIP-II 2014-2015
Entrance Examination Syllabus

WATER RESOURCES

1. ECOLOGY & ENVIRONMENT: (15 Marks)

Nature of Ecosystems, Energy flow in Ecosystems, Energy Fixation by Autotrophs, Energy beyond the Producers, Biogeochemical cycles and ecosystems, Population growth, Dynamics of ecological communities, National water Resources problems with reference to the environment of major river valley projects, global climate, Indian monsoon systems, Climate change its impact on water and Environment.

Suggested Reading Material: 1. Concepts of Ecology by E.J.Kormondy.

2. WATER POLLUTION AND WASTEWATER TREATMENT: (15 Marks)

Water Quality requirements for drinking, Agricultural and Industrial uses, Surface and Groundwater Pollution problems with reference to BOD, COD and suspended matter in the surface water, Fluoride, Nitrate, Arsenic and Iron pollution problems in ground water of India. Water Treatment process, Sedimentation, Coagulation and Filtration, Water Treatment process, Sedimentation, Coagulation and filtration, advanced water treatment technologies- Reverse Osmosis, ultra filtration, microfiltration, secondary treatment and tertiary treatment.

Suggested Reading Material:

1. Elements of Public Health Engineering by K.N.Duggal
2. Environmental Engineering by G.S.Birdie
3. Wastewater Treatment and Disposal by Metcalf and Eddy

3. FUNDAMENTALS OF SURFACE HYDROLOGY: (15 Marks)

Hydrologic Cycle- Precipitation: Different types and forms of precipitation and their Mechanism. Rain Gauges, Evaporation and Transpiration: Concepts, measurements and factors affecting evaporation and transpiration. Infiltration-Concept, measurement and factors affecting infiltration, runoff, definition and factors affecting runoff, stream gauging – computation of runoff, rainwater harvesting, soil moisture measurement and management, methods of irrigation – Furrow, border strip, drip, Sprinkler, Soil and water conservation techniques.

Suggested Reading Material:

1. A Text book of Hydrology by P.Jayarami Reddy
2. Hydrology by H.M.Raghunath
3. Wastewater Treatment and Disposal by Metcalf and Eddy

4. FUNDAMENTALS OF GROUNDWATER HYDROLOGY: (15 Marks) Occurrence of groundwater in consolidated and unconsolidated formations – Types of aquifers, Properties – porosity, Specific Yield, Storativity, Hydraulic Conductivity and Transmissivity- Darcy's Law, Groundwater Management – Artificial recharging methods, geological and geophysical exploration of groundwater, well logging techniques, Types of wells, open wells, tube wells, construction of wells, groundwater modeling techniques.

Suggested Reading Material:

1. Groundwater Hydrology by D.K.Todd
2. Groundwater by H.M.Raghunath.

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IST,JNTUH Full Time Ph.D. Programme Under TEQIP-II 2014-2015

Entrance Examination Syllabus
ENVIRONMENTAL SCIENCES

UNIT-I Ecology and Environment

Definition, scope and principles of ecology, Physical, chemical, environmental factors and their relation to organisms; Climatic factors; Topographic (Physiographic) factors; Edaphic factors (Soil Science); Ecological adaptations; Population ecology; Ecological pyramids; Structure and functions of an ecosystem; Biomes and biodiversity. Ecological energetics - Energy flow in ecosystem; Food chains - role of producers and consumers. Nutrient cycles in ecosystem - biogeochemical cycles; Environmental management and pollution; Sustainable development; Environmental Impact Assessment; Environmental audits; Environmental laws. Energy resources - renewable and non-renewable; Major ecosystems and ecosystem modeling.

UNIT-II Environmental Chemistry

Basic concepts and scope of environmental chemistry; Environmental segments- Atmosphere - Structure and composition of atmosphere, temperature inversion, Atmosphere photo-chemistry, Ozone depletion, Greenhouse effect, CFC's, SMOG, Acid rain. Hydrosphere- Water resources, hydrological cycle, unique physical and chemical properties of water, complexation in natural and wastewater, role of microorganisms in aquatic chemical reactions, redox reactions. Lithosphere- Composition of lithosphere, soil, inorganic and organic compounds in soil, micro and macro nutrients, ion exchange in soils, soil pH, trace elements in soil, organic matter in soil, macro-nutrients in soil, nitrogen pathways and NPK in soil. Environmental toxicology-Toxic chemicals in the environment and their biochemical effects.

UNIT-III Environmental Microbiology

Diversity of microorganisms; General characters, important uses and harmful effects of
a) Protozoa, b) Algae, c) Fungi, d) Bacteria, e) Virus; Microbial nutrition, macronutrients, micronutrients, trace elements and growth factors; Nutrient media (selective, differential, enriched and enrichment) and growth conditions, Nutritional types; Bacterial growth curve, diversity, growth and nutritional requirements; Control of microorganisms- Inhibition of growth and killing, sterilization and disinfection; Characteristics of an antimicrobial agent; mode of action and factors affecting antimicrobial agent, physical and chemical agents, evaluation of antimicrobial activity.

UNIT-IV Environmental Geology, Remote Sensing and GIS

Origin and age of earth, internal constitution of earth, geological processes, basic principles of structural geology, geomorphic cycle, definition and types of weathering, erosion cycle, denudation. Map terminology and map reading, map projections, evolution of map projection, explanations of reference lines on earth, developable projection surfaces- cylindrical, conical, azimuthal; map classifications. Aerial photogrammetry, classification of aerial photographs, air photo interpretation key elements. Basics and fundamental concepts of remote sensing, Electromagnetic radiation, Electromagnetic spectrum, Remote Sensing Platforms and Sensors, Image processing methods. Basic concepts of GIS, components of GIS, GIS categories, Fundamental operations of GIS, Theoretical framework of GIS, Basic spatial analysis in GIS. Introduction & components of GPS.

UNIT-V Air Pollution and Control Technologies

Air pollution - types and sources; Air pollutants - classification and properties; Meteorological aspects of air pollution; Air pollution - sampling and measurement; Control methods-particulate and gaseous emissions;

Automobile pollution; Air pollution laws and standards; Air quality modeling, data requirements for air quality modeling, modeling procedures.

UNIT-VI Water and Wastewater Treatment Technologies

Water resources - availability and use; Water management and conservation; Water pollution-types, sources and impacts; Water pollutants-types and measurement/analysis; Instrumental methods of analysis. Water treatment processes - Layout of treatment plant. Characterization and degree of treatment of wastewater, primary treatment, sedimentation, flotation, secondary (biological) treatment, design principles in biological treatment facilities, activated sludge process, trickling filters, sludge treatment and disposal; advanced wastewater treatment. Wastewater treatment for specific industries- sugar, paper and pulp, tannery etc.

Recommended Books:

1. Ecology, E.P. Odum, 1983, Holt-Saunders International Edition
2. Ecology & Environment, P.D.Sharma, Ashish publications,1994.
3. Environmental Chemistry, A.K. De, New Age Intt. Pub. Co., New Delhi, 1990
4. Environmental Chemistry, B.K.Sharma S.H.Kaur Goel Publishing House, Meerut, 1992.
5. Waste Water Treatment, Metcalf & Eddy
6. Remote Sensing and GIS, M. Anji Reddy
7. Microbiology, Pelczar Reid & Chan, Tata Mc Graw Hill Publishing Company Ltd., 1996
8. Remote sensing and image interpretation, T.M. Lillesand and R.W. Keifer
9. Environmental Impact Assessment, Canter, L.W., 1977, McGraw Hills New York.
10. Hofmann wellenhof, B. Lichtenegger, H. and Collins, J. Global positioning system, Springer - Verlag, New york, 1994.
11. A text book of Geology by P.K. Mukharjee

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IST,JNTUH Full Time Ph.D. Programme Under TEQIP-II 2014-2015
Entrance Examination Syllabus
NANO SCIENCE & TECHNOLOGY

1. PHYSICAL CHEMISTRY

ATOMIC STRUCTURE : HYDROGEN SPECTRUM, PLANK'S QUANTUM THEORY Bohr's theory of hydrogen atom, Energy levels and explanation of hydrogen spectra, limitations of Bohr's Theory. Quantum numbers, wave nature of electron and uncertainty principle – Schrodinger wave equation Dependence of probability functions on distance from nucleus and directions – shapes of atomic orbitals (Calculation involving frequency and Rydberg's constants), Concept of chemical bonding ionic bonding and covalent bonding.

CHEMICAL EQUILIBRUM : Reversibility – Dynamic nature of equilibrium Kp, Kc and their interrelation, derivation of quantitative expression for equilibrium constants for a few typical reactions, factors effecting the equilibrium constants.

GASEOUS STATE: Kinetic theory of gases – Derivation of kinetic equation and deduction of gas laws – Mean free path, collision number and collision diameter – principles of equipartition of energy – Heat capacities for mono, di and tri atomic molecules deviation from gas laws – Vander wall's equation Critical phenomena – Isotherms of carbon dioxide – Determination of critical constants – Derivation of relation between Vander wall's constants and critical constants – law of corresponding states and its usefulness / applications.

2. SOLID STATE DEVICES & QUANTUM MECHANICS

Semiconductors: Intrinsic semiconductors, electrons and holes, Fermi level. Temperature dependence of electron and hole concentrations. Doping; impurity states, n and p type semiconductors, conductivity, mobility, Hall effect, Hall coefficient.

Origin of the quantum theory: Failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect, Ritz combination principle in spectra, stability of an atom. Planck's radiation law, Einstein's explanations of photoelectric effect, Bohr's quantization of angular momentum and its applications to hydrogen atom, limitations of Bohr's theory.

Wave-particle duality and uncertainty principle: De Broglie's hypothesis for matter waves; the concept of wave and group velocity evidence for diffraction and interference of 'particles'.

Consequences of De Broglie's concepts; quantization in hydrogen atom; energies of a particle in a box, wave packets, Heiesnberg's uncertaintity relation for p and x, its extension to energy and time.

Consequences of the uncertainty relation: Gamma ray microscope, diffraction at a slit, particle in a box, position of electron in Bohr orbit.

Quantum Mechanics : Schrodinger's equation. Postulatory basis of quantum mechanics; operators, expectation values, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator, reflection at a step potential, transmission across a potential barrier.

3. NANO TECHNOLOGY

Synthesis of Nano materials – various methods; Thinfilm fabrication methods; Biological building blocks, Nucleic acids – DNA double Nano wires, genetic code; MEMS & NEMS, Nano biosensors, DNA computing and quantum computing,, size effects and properties of nano materials; various methods of Nano materials characterization, Molecular electronics quantum electronic devices, short channel M O S Transistor, RTD, RTBT multiplexer; Spintronics, spatial al computing as molecular electronics, carbon nano tubes synthesis and types, fullerenes, applications.

4. NANO MATERIIALS FOR ENERGY AND ENVIRONMENT AND NANO ETHICS:

Energy characteristics – Fundamentals of environment, Environmental impact assessment of nano materials used in energy and environmental applications and their properties. Device applications, Energy – Hydrogen storage and production – Fuel cells – Solar energy conversion; Nano materials in Automoibiles. Nano ethics, Impact on society and environment.

5. PROGRAMMING IN C, DATA STRUCTURES & DISCRETE MATHEMATICS:

Data types, Operators and Expressions, Input Output Statements, Control Statements, Functions, Arrays, Pointers, Structures & Unions, Preprocessors, Programming in C.

Searching and Sorting Techniques, Expression, Evaluation, Stacks, Queues, Linked Lists, Trees, Graphs and applications.

Sets and relations, Fundamentals of prepositional logic, inference, elementary combinatories, Probability, Mathematical Induction.

6. ELECTRONICS & CONTROL SYSTEMS:

POWER SUPPLY : Diode as a circuit element, load line concept, rectification, ripple factor, zener diode, voltage stabilization, IC voltage regulation, characteristics of a transistor in CB, CE and CC mode, graphical analysis of the CE configuration, low frequency equivalent circuits, h-parameters, bias stability, thermal runaway.

System concept – mathematical models of physical systems – block diagram algebra – feedback characteristics – reduction in parameter variations by use of feed back – PID controllers – time response analysis – concept of stability – frequency response analysis.

References

Introduction to Nano Technology by Charles. P. Poole Jr & Frank J. Owens. Wiley India Pvt. Ltd.

1. Solid State physics by Pillai; Wiley Eastern Ltd.
3. Nano Technology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springer.
4. Nano: The Essentials – Understanding Nano Science and Nanotechnology – by T.Pradeep; Tata Mc.Graw Hill.
5. Bio Nano Technology by Good Sell – Wiley Liss.
6. A text book of Quantum Mechanics by P.M.Mathews and K.Venkatesan, Tata Mcgraw.
7. Modern quantum mechanics By Sakurari addition.Wesly Longman inc. Hill.
8. Inorganic material synthesis and fabrication by JN Lalena etall John Welly and Sons inc.
9. James J Allen Micro Electro Mechanical System Design, CRC Press
10. K. Subramanyam – Micro Electro Mechanical system – A design Approach. Springer 2008
11. Tai – Ran HSW – MEMS & Micro systems design and manufacture Tata Mcgraw, New Delhi.
12. Thin Film Phenomenon by K.L Chopra Mcgraw Hill
13. Renewable energy sources by JJ.Twidell and Tweir E&F Spon Ltd.,
14. Fuel Cell Technology Hand book by Hoogers, CRC Press.
15. Characterization of nao Structured materials by ZL Wang.

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CHEMICAL ENGINEERING

Process Calculations and Thermodynamics:

Laws of conservation of mass and energy; use of tie components; recycle, bypass and purge calculations; degree of freedom analysis. First and Second laws of thermodynamics. First law application to close and open systems. Second law and Entropy Thermodynamic properties of pure substances: equation of state and departure function, properties of mixtures: partial molar properties, fugacity, excess properties and activity coefficients; phase equilibria: predicting VLE of systems; chemical reaction equilibria.

Fluid Mechanics and Mechanical Operations:

Fluid statics, Newtonian and non-Newtonian fluids, Bernoulli's equation, Macroscopic friction factors, energy balance, dimensional analysis, shell balances, flow through pipeline systems, flow meters, pumps and compressors, packed and fluidized beds, elementary boundary layer theory, size reduction and size separation; free and hindered settling; centrifuge and cyclones; thickening and classification, filtration, mixing and agitation; conveying of solids.

Heat Transfer:

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

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

Chemical Reaction Engineering:

Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; residence time distribution, single parameter model; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis.

Instrumentation and Process Control: Measurement of process variables; sensors, transducers and their dynamics, transfer functions and dynamic responses of simple systems, process reaction curve, controller modes (P, PI, and PID); control valves; analysis of closed loop systems including stability, frequency response and controller tuning, cascade, feed forward control.

Chemical Technology: Inorganic chemical industries; sulfuric acid, NaOH, fertilizers (Ammonia, Urea, SSP and TSP); natural products industries (Pulp and Paper, Sugar, Oil, and Fats); petroleum refining and petrochemicals; polymerization industries; polyethylene, polypropylene, PVC and polyester synthetic fibers.

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