9. Admission to ME/MTech PROGRAMME

Mode of Program: Regular

9.1 ELIGIBILITY FOR ADMISSION

Admission to all the ME/MTech programmes shall be made on the basis of valid GATE Score in respective discipline. First preference will be given to GATE qualified candidates. After offering seats to the GATE qualified candidates, for seats remaining vacant (if any), the admission will be made on the merit of the entrance test to be conducted by the University *across India and only those candidates who shall be having minimum 20% (15% for SC/ST) in the entrance test shall only be considered for admission.*

Admission to ME/MTech programme will be open to a candidate who obtains at least 60% (55% for SC/ST) marks in the aggregate in the qualifying examination from a recognised University.

Notes:
   (1) For ME (Computer Science and Engineering, Software Engineering, Electronics and Communication) and MTech (Computer Applications), only GATE qualified candidates shall be admitted. Non-GATE candidates are advised not to apply for these programs.
   (2) Each ME/MTech program shall run if minimum of 15 students are admitted in it.

Qualifying examination for ME/MTech programme in various disciplines is as under:

ME Programmes

CAD/CAM Engineering
   BE/BTech degree in Mechanical/Production/Industrial Engineering.

Structural Engineering
   BE/BTech degree in Civil Engineering.

Civil (Infrastructure) Engineering
   BE / BTech in Civil Engineering, BE/ BTech in Infrastructure Engineering

Electronics & Communications Engineering#
   BE/BTech degree in Electronics & Communication

Wireless Communications#
   B.E / B.Tech or equivalent, Applied Electronics & Telecommunication / Electronics Telecommunication / Telecommunication Engineering / Electronics & Telematics / Electronics and Communication Engineering / Electrical and Electronics

Gate Qualified candidates with BE/BTech in Electronics and Communication shall only be considered for admission on the basis of GATE score

Production Engineering
   BE/BTech degree in Mechanical/Production/Industrial/Automobile Engineering.

Software Engineering*

BE/BTech degree in any discipline of Engineering OR MSc in Mathematics/Statistics/Computer Science/ Electronics/Physics/Operations Research/Information Science/Information Technology OR MCA OR Equivalent

Computer Science & Engineering*

BE/BTech degree in any discipline of Engineering OR MSc in Mathematics/Statistics/Computer Science/ Electronics/Physics/Operations Research/Information Science/Information Technology OR MCA OR Equivalent

Information Security*

BE/BTech degree in any discipline of Engineering OR MSc in Mathematics/ Statistics/ Computer Science/ Electronics/ Physics/ Operations Research/ Information Science/ Information technology OR MCA OR Equivalent.

* Gate qualified candidates with valid gate score in "Computer Science and Information Technology" shall only be considered for admission on the basis of GATE score.

Electronic Instrumentation & Control Engineering

BE/BTech/ degree in Electrical/Electronics/Instrumentation Engineering OR MSc Physics with Electronics

Power Systems

BE./BTech in Electrical Engineering.

Thermal Engineering

BE/BTech degree in Mechanical/Production/Industrial/Aeronautical/Chemical/RAC/ Automobile Engineering

MTech Programmes

Biotechnology

B.E./B.Tech. Degree in Biotechnology/Chemical / Industrial Biotechnology / Bio-chemical Engineering /Bio-Medical Engineering / Bio-Informatics or a Bachelor's Degree in Pharmacy or M.Sc. Degree in Biochemistry / Biotechnology / Microbiology / Bio-Physics / Biology / Botany / Zoology/ Genetics / MBBS / M.Sc.(Ag) & M.V.Sc.

Metallurgical & Materials Engineering

BE/BTech degree in any branch of Engineering OR MSc in Materials Science/Physics/ Chemistry (with Physics and Mathematics at BSc Level)

Environmental Science & Technology

BE/BTech degree in any branch of Engineering or Technology, OR MSc in Chemistry/Biochemistry/Biotechnology/Life Sciences (including Botany and Zoology)/ Atmospheric Sciences.

Energy Technology and Management

BE/BTech in any branch of Engineering / Technology OR MSc in Physics or Chemistry with Mathematics at graduation level.

VLSI Design

BE/BTech degree in Electronics /Computer Science/Electronics & Communication/Electronics (Instrumentation & Control)/Electrical Engineering OR MSc in Computer Science/Electronics/Physics with Electronics / Instrumentation with Mathematics as one of the subjects in B.Sc

Chemical Engineering

B.E./B.Tech. (Chemical Engineering/Technology, Environmental, Biotechnology, Pulp and Paper Technology/PolymerTechnology/Metallurgy/Materials/ Mechanical/ Ceramics Engineering or allied discipline) or M.Sc.(Applied /Industrial Chemistry) with Mathematics upto B.Sc. level.

Computer Applications

BE/BTech Degree in any discipline OR M.Sc. in Mathematics /Statistics /Operation Research /Computer Science / Electronics/ Information Technology/ Physics OR MCA OR equivalent.

Note: Candidate who has passed Section B of the Institution of Engineers (India) or Grade IETE and has three years of professional experience in reputed organization are also eligible for admission to ME/MTech programme in respective disciplines.

Sponsored Candidates with 55% marks in the qualifying examination are eligible for admission. Such candidates must have a minimum of two years of full time work experience in a registered firm/company/industry/educational and research institutions/any Government Department of Government Organization in the relevant field in which admission is being sought. The employer in the sponsorship certificate must indicate that the fee will be borne by the sponsoring organization and the candidate will not be withdrawn before the completion of the programme. **The fee of the sponsored candidates shall be paid by the sponsoring agency from the company's bank account.**

Candidates who are appearing in the final exam of the qualifying degree are eligible to apply. Such candidates have to furnish following undertaking at the time of document checking/'In Person'counselling.

"I am applying on my own risk and responsibility as my final result of the qualifying exam has not been declared by the University.

I do hereby declare that I do not have any backlog paper in any of the previous semesters (Years) of study of the qualifying exam and also I do not expect any backlog in my final exam.

I assure you that I will produce the proof of passing of my qualifying examination with the minimum percentage of marks required on or before **December 31, 2014**, *failing which my admission shall stand cancelled and I shall not claim any right on any count whatsoever."*

9.2 NUMBER OF SEATS

The University offers PG programme of four semesters (regular) leading to ME/Mtech degree. The distribution of seats discipline-wise is as under:

Regular Programs:

Programme	Name of the Deptt/School	Number of Seats		
		Open	Sponsored	SC/ST
ME Programme				
CAD/CAM Engineering	MED	19	5	6
Structural Engineering	CED	19	5	6
Civil Infrastructure Engineering	CED	19	5	6
Electronics & Communication Engineering	ECED	19	5	6
Wireless Communications	ECED	19	5	6
Production Engineering	MED	19	5	6
Software Engineering	CSED	19	5	6
Electronic Instrumentation & Control Engineering	EIED	19	5	6
Computer Science & Engineering	CSED	19	5	6
Power Systems	EIED	19	5	6
Thermal Engineering	MED	19	5	6
Information Security	CSED	19	5	6
MTech Programme				
Biotechnology	BTD	19	5	6
Metallurgical & Materials Engineering	SPMS	19	5	6
Environmental Science & Technology	SEES	19	5	6
Energy Technology and Management	SEES	11	5	4
VLSI Design	ECED	19	5	6
Chemical Engineering	CHED	19	5	6
Computer Applications	SMCA	19	5	6

In addition to above seats, 1% over and above seats are reserved for children of employees of Thapar University. The candidates seeking admission under this category are required to satisfy the eligibility as mentioned above at 9.1.

5 seats in each regular discipline of ME/MTech programme are available for FN/NRI candidates. Refer section 11 for eligibility and other conditions.

Seats, if any in the sponsored category remained unfilled; such vacant seat(s) shall be filled by General category candidates.

9.3   LEAVE RULES

ME/MTech regular students getting scholarship shall be entitled for leave for a maximum period of thirty days per year in addition to general holidays but not entitled to vacation, e.g., summer, winter, etc. The students must apply for leave in advance and obtain the sanction from the concerned Head of the Department/School. The student shall be required to give an undertaking to the effect that he/she would not leave the course midway or appear in any competitive examinations, etc., not related to Engineering & Technology, in order to be eligible to receive this scholarship.

9.4 DURATION OF PROGRAMME

The normal duration of programme leading to the ME/MTech degree shall be four semesters for regular students, which includes course work of twelve subjects, seminar, minor project and Dissertation. The maximum duration for regular programmes is six semesters.

9.5 SCHOLARSHIPS/ASSISTANTSHIP

The candidates admitted in ME/MTech with valid GATE score will be considered to receive scholarships only if approved and amount released by AICTE or any other funding agency. It will be obligatory for every post-graduate student to undertake eight to ten hours per week of work related to teaching and research activities as assigned to him/her by the University. This could include tutorials, laboratories classes, development and maintenance of laboratories, assistance in research and development activities undertaken by faculty members, maintenance and operation of computers and other central facilities, assistance in library etc.

There are 70 teaching assistantships (₹72,000- per annum: 30, ₹ 48,000- per annum: 40) for students who will not be getting GATE scholarships. The decision regarding eligibility criteria for distribution of these scholarships will be decided by DoAA. Teaching load shall be given to such candidates as per the guidelines of the University.

9.6 Minimum intake in a ME/MTech program: No ME/MTech program shall run with less than 15 students admitted in that program.

9.7 ME/MTech Admission schedule:

There will be ONLINE entrance test and counselling shall be as per given schedule.

Note:
  i.   No TA/DA will be paid for appearing in the Entrance test/Interview etc

  ii.   A candidate willing to apply for more than one ME/MTech programme, whether in same or different departments/schools, is required to fill separate form for each programme alongwith requisite exam fee.

  iii.   Candidates are advised to browse www.thapar.edu

IMPORTANT DATES AND INFORMATION:

The online application form is available on www.thapar.edu. Fill the complete details and then take the **print out** of the form. Paste a recent passport size photograph on it. Please keep one copy of the printout of completely filled form as it will be required at the time of document checking during counselling. You can pay the the required amount online or attach DD (in favour of Thapar University and payable at Patiala) and send it to "Incharge Admission Cell' Thapar University, Patiala (Punjab)-147004.

Application fee:

Amount to be deposited with **print out** of application forms taken from website.	Rs 1500

IMPORTANT DATES

	ME/MTech programs
Last date for receipt of completed application forms.	June 04, 2014
Date of Entrance test to be conducted by TU	ONLINE Entrance test (**June 24 – 29, 2014**) Browse www.thapar.edu for details
Display of result of Entrance Test	For others: July 07,2014

Admission schedule:
ME/MTech Admission schedule:

For GATE Qualified candidates:

Programme	*Name of the Deptt/School*	Date of counselling including deposit of fee	Time of interview
ME Programme			
Computer Science & Engineering	CSED	June 16, 2014	9.00 AM
Software Engineering	CSED	June 16, 2014	10.00 AM
Information Security	CSED	June 16, 2014	11.00 AM
Electronics & Communication Engineering	ECED	June 16, 2014	11.30 AM
Wireless Communications	ECED	June 16, 2014	12.30PM
Electronic Instrumentation & Control Engineering	EIED	June 17, 2014	9.00 AM
Power Systems	EIED	June 17, 2014	10.00 AM
CAD/CAM Engineering	MED	June 17, 2014	11.00 AM
Production Engineering	MED	June 17, 2014	12.00 Noon
Thermal Engineering	MED	June 17, 2014	1.00 PM
Structural Engineering	CED	June 17, 2014	2.00 PM
Civil Infrastructure Engineering	CED	June 17, 2014	3.00 PM

MTech Programme			
Computer Applications	SMCA	June 16, 2014	2.00 PM
VLSI Design	ECED	June 16, 2014	3.00 PM
Biotechnology	BTD	June 17, 2014	2.30 PM
Environmental Science & Technology	SEE	June 17, 2014	3.00 PM
Energy Technology & Management	SEE	June 17, 2014	3.30 PM
Chemical Engineering	CHED	June 17, 2014	4.00 PM
Metallurgical & Materials Engineering	SPMS	June 17, 2014	4.30 PM

Display of number of vacant seats in various disciplines of ME/MTech after offering seats to GATE qualified in above mentioned schedule : July 01, 2014

Counselling including deposit of fee for these vacant seats : July 14-15, 2014

Programme	Name of the Deptt/School	Date of counselling/Interview & deposit of fee	Time of interview
ME Programme			
Computer Science & Engineering	CSED	July14, 2014	9.00 AM
Software Engineering	CSED	July14, 2014	10.00 AM
Information Security	CSED	July14, 2014	11.00 AM
Electronics & Communication Engineering	ECED	July14, 2014	11.30 AM
Wireless Communications	ECED	July14, 2014	12.30 PM
Electronic Instrumentation & Control Engineering	EIED	July15, 2014	9.00 AM
Power Systems	EIED	July15, 2014	10.00 AM
CAD/CAM Engineering	MED	July15, 2014	11.00 AM
Production Engineering	MED	July15, 2014	12.00 Noon
Thermal Engineering	MED	July15, 2014	1.00 PM
Structural Engineering	CED	July15, 2014	2.00 PM
Civil Infrastructure Engineering	CED	July15, 2014	3.00 PM
MTech Programme			
Computer Applications	SMCA	July14, 2014	2.00 PM
VLSI Design	ECED	July14, 2014	3.00 PM
Biotechnology	BTD	July15, 2014	2.30 PM
Environmental Science & Technology	SEE	July15, 2014	3.00 PM
Energy Technology & Management	SEE	July15, 2014	3.30 PM
Chemical Engineering	CHED	July15, 2014	4.00 PM
Metallurgical & Materials Engineering	SPMS	July15, 2014	4.30 PM

Last round of counselling for vacant seats if any : July 29, 2014

Note: In all the rounds of counselling, the GATE qualified candidates shall get first preference based on merit. Those who missed the earlier round can attend any counselling held later but their admission will be on merit & subject to availability of seat.

Venue for counseling/document checking: University Auditorium

FOR ANY OTHER DETAILS INCLUDING ELIGIBILITY CRITERIA, FEE ETC

CONTACT (08288008120, 08288008121)
Email: admissions@thapar.edu
Website: www.thapar.edu

IMPORTANT NOTE: Candidates are advised to regularly browse www.thapar.edu for information/instructions regarding admissions. No separate letters shall be sent.

All applications must be sent to "Incharge Admission Cell' Thapar University, Patiala (Punjab)-147004.

Documents required at the time of counselling:

Candidates must bring with them following original certificates and **a set of attested copies of all the certificates** at the dates specified hereunder for various programmes.

- **Copy of the Application form**
- 10+2 /diploma/graduation/post graduation DMC
- Matriculation/Higher Secondary Certificate showing Date of Birth
- Result Card of Entrance Exam
- Admit Card of Entrance Exam
- GATE score card for ME/MTech admissions
- Character Certificate
- Medical Fitness Certificate
- Reserved Category Certificate on the prescribed proforma and signed from the competent authority (if applicable)
- Affidavit required in case of discontinuity of studies
- Undertaking by candidates not having result of qualifying exam as per prescribed format in case of ME/MTech admissions.
- Migration Certificate
- Income Certificate
- **Check list proforma**

Commencement of session: July 21, 2014

HOW TO APPLY

1   Candidates seeking admission in TU shall fill up the online form available on our website www.thapar.edu.Kindly fill the complete details and then take two print outs of the form and paste a recent passport size colored photograph.

   Application fee paid Online: Please send one of the printouts of form to the Incharge Admission Cell. The hardcopy of application form alongwith required documents should reach the University within 7 days after the last date of submission of online applications.
   .
   Application fee paid through DD: Please send one of the printouts by attaching the required amount of DD (in favour of Thapar University and payable at Patiala).

   Retain second copy of the printout of the form to be produced at the time of document checking of original documents during counseling.

   Important Note: A candidate cannot claim admission merely by filling the application form and paying the application fee. If he/she fulfils the eligibility criteria as per the prospectus, only then he/she shall be considered for admission during counseling. So, candidates are advised to read eligibility and other conditions before filling the form.

2   The original certificates and set of attested copies of the certificates are required to be produced at the time of document checking.

3   Every candidate must indicate in his/her application the category of seat for which he/she wants to apply. **A copy of the certificate of the reserved category (if applicable) shall be attached.**

4   Application completed in all respects should reach the INCHARGE ADMISSION CELL, THAPAR UNIVERSITY, PATIALA -147004, on or before the last prescribed date of the respective programmes.

5   Incomplete application in any manner and received after the due date/time will be rejected. The University does not take any responsibility for postal delay or loss in transit of the application form, demand draft, withdrawal form or any other communication in this regard.

6   The specimens of the format of the required certificates are available on our website for the guidance of candidates. Each certificate must be submitted on the prescribed format and must be issued by the competent authority as mentioned, under proper seal/stamp of their office on a date prior to or on the last date for submission of application form.

7   **PENALTY FOR WRONG INFORMATION/SUPPRESSION OF INFORMATION.**

   If at any stage it is found that a candidate has concealed, suppressed or distorted any informaton/fact,in the application form,his/her admission to the University, if granted, shall stand cancelled. He/she will have no claim, whatsoever, against the University.

8   The provisions of Prospectus 2014-15 may be changed by the competent authority without any notice.

9   In case of any dispute, the decision of the Director, TU, Patiala shall be final and binding on the candidates.

10   **For candidates other than BE/BTech**
     Candidates who are appearing in the final exam of the qualifying degree/diploma(for LEET) are eligible to apply. Such candidates have to furnish following undertaking at the time of counselling.
     "I am applying on my own risk and responsibility as my final result of the Qualifying exam has not been declared.
     I do hereby declare that I do not have any backlog paper in any of the previous semesters (Years) of study of the qualifying exam and also I do not expect any backlog in my final exam.
     I assure you that I will produce the proof of passing of my Qualifying examination with the minimum percentage of marks required on or before December 31, 2014, failing which my admission shall stand cancelled and I shall not claim any right on any count whatsoever."

11   **Candidates applying for more than one discipline (whether in same or other department) of ME/MTech programmes are required to fill separate application form for each discipline.**

INSTRUCTIONS FOR ONLINE ENTRANCE TEST

1   Entrance test of for seats remaining vacant after offering seats to GATE qualified candidates shall be conducted ONLINE.

2   Candidates will be able to generate 'Admit Card' from April 16-June 17, 2014 provided their DD alongwith print out of application form reaches Thapar University in time. The login id and password created by candidate at the time of filling the application form shall be used to register for generation of Admit card.

     Note: The Admit card shall be issued provisionally to the candidate subject to his/her satisfying the eligibility condition.

3   After registering, the candidate shall take out two print outs of 'Admit Card", paste latest photograph on each and then come to the entrance test centre. Alongwith admit cards, the candidate will also carry any one of the identity proof (Original) with him/her like Passport/Voter I Card/ PAN Card/ Driving License. One copy of the admit card shall be retained by the entrance test centre. The candidate shall keep the other copy (duly acknowledged by the examiner at test centre) to be shown at the time of document checking.

4   **The entrance test shall contain objective type questions. Other details are as under:**

SNo	Name of the programme	Duration of Entrance Test	Number of questions in the entrance test
1	ME/MTech (for each programme/test)	1.5 hours	75

5   While registering for ONLINE entrance test on our website, the candidate shall choose entrance test centre of his/her choice from the available list and any one

slot available in the test period given above i.e. (**June 24 – 29, 2014**). Once slot is chosen, it cannot be changed thereafter.

6   Filling of valid mobile number is mandatory.

General Instructions:

1   In case of a tie among candidates securing equal marks in the merit list, the same will be broken in accordance with the following criteria:

(a) Candidate senior in age shall rank higher in order of merit.

(b) In the case of a tie in age also, a candidate getting higher percentage of marks in the qualifying examination shall be ranked higher in order of merit.

(c) In the case of a tie in percentage of marks in the qualifying examination also, a candidate securing higher percentage of marks in matriculation/secondary or equivalent examination shall rank higher in order of merit.

2   Withdrawal of Seat / Refund of fee:

Candidate wishes to withdraw the seat, must submit the application to IN-CHARGE, ADMISSION CELL, Thapar University. The fee will be refunded after adjusting all the outstanding dues, if any. The candidates are advised to mention their Account Number and IFSC code of the bank for the prompt refund.

	Date of Receipt of Application		**Amount to be refunded**
(i)	One day before the final counseling or before the start of the session	:	After deducting Rs. 1000/- of the total fee deposited.
(ii)	From the date of final counselling and up to September 30, 2014	:	50% Tuition Fee + 50% Development Fee + University Security and Alumni Fee + 50% of all Hostel dues (if applicable)
(iii)	After September 30,2014	:	University Security + Alumni Fee

3   Seats, if any in the reserve categories remained unfilled, such vacant seats shall be filled by General category candidates on the basis of merit. In case a SC seat remains vacant, it will be first offered to ST candidate or a vice versa before converting into General Category.

4   Candidates from physically handicapped category are required to produce the Medical Certificate from the Chief Medical Officer of the District concerned, which should indicate the extent of permanent disability in support of their claim. Minimum 40% permanent disability is required to be eligible under this category. Further, the above provisions will be subject to the decision of the Admission Committee of the University whether such a candidate would be able to pursue the studies at the University with the specific disability. The decision of the Admission Committee in this regard shall be final.

5   No separate letters for counseling/document checking/deposit of fee shall be issued for any programme.

6   **Admitted candidates will have to submit the migration certificate from the earlier University/Board within a month of their admission.**

7   Electronic gadgets such as Mobile Phones, Pagers, etc. are not permitted in the Examination Centre.

8   The statements made in this Prospectus and all other information, contained herein are believed to be correct at the time of publication. However, the University reserves the right to make at any time, without notice, changes in and/or additions to the regulations of University and conditions governing the conduct of students, requirements for degree, fee and any other information, or statements contained in this Prospectus either on its own or under any rules or regulations imposed by UGC/MHRD. No responsibility will be accepted by the University for hardship or expense encountered by its students or any other person for such changes, additions, omissions or errors, no matter how they are caused.

9   All disputes will be subject to jurisdiction of the Courts at Patiala only. The person in whose name the University can sue or be sued shall be the Registrar, Thapar University, Patiala.

10   The students of all the regular programmes are not allowed to join any job till they complete all the requirements for the award of degree. Only part-time students are allowed to join job.

11   In case,
a selected candidate submits false information about fee, eligibility, rank of entrance test
or
a candidate who is not offered any seat but deposits the full fee

then seat allotted to him/her shall stand cancelled.

12   Candidates must be medically fit and must bring along with them a medical fitness certificate signed by a Gazetted Medical Officer at the time of admission on the prescribed proforma as per Annexure-IV.

13 MODES OF PAYMENT OF APPLICATION FEE AND OTHER DUES:

   13.1   **APPLICATION FEE : In the form of DD or through Online payment.**

   13.2   **TOTAL FEE:**

      i)   **Receipts in any Axis Bank/Kotak Mahindra Bank account-to-account transfer**): It is available in all the branches of **Axis Bank/Kotak Mahindra Bank**. A sample payment pay-in-slip is enclosed at Annexure-IX. The system generates **Journal Number** which is to be used for linking the payment. The students are instructed to get the 6-10 digit **journal number** from the branch where they have made the payment and feed the same in the web site where the details are captured along with date of payment. The deposit of amount in the below mentioned account of the University will not give any right to the depositor for jurisdiction of the station where it has been deposited in any manner what so ever it may be.

      For depositing money through AXIS/KOTAK MAHINDRA BANK, a candidate can deposit money in favour of the following account:

AXIS Bank	KOTAK MAHINDRA BANK LTD
910010028666757	02630020000237

ii) In the form of Demand Draft (DD), the DD of requisite amount should be made in favour of Thapar University, Patiala and payable at Patiala. The DD must reach the University on or before the prescribed date otherwise the candidature shall be cancelled.

iii) **Candidates depositing total fee through AXIS/KOTAK MAHINDRA BANK must enter complete details in 'Fee Confirmation Slip' (FCS) available at** www.thapar.edu **on or before the respective last prescribed date. In case, a candidate fails to enter the details, his/her candidature will not be processed further.**

GENERAL INFORMATION REGARDING ME/MTECH ENTRANCE TEST INCLUDING ENTRANCE TEST SYLLABUS
Duration of test: 90 minutes (75 Questions)
Negative marking: ¼ marks shall be deducted for each wrong answer.

1   ME PROGRAMME (REGULAR)

   (I)   CAD/CAM ENGINEERING
   (II)   THERMAL ENGINEERING
   (III)   PRODUCTION ENGINEERING

Section-A
Solid Mechanics, Machine Design, Theory of Machines, Mechanical Vibrations, Machine Drawing, CAD, CAM and Robotics, Computer Programming
Section-B
Thermodynamics, Steam Engineering, IC Engines and Gas Turbines, Turbo Machines, Fluid Mechanics and Machinery, Refrigeration and Air Conditioning, Heat and Mass Transfer, Power Plant Engineering, Non-conventional Sources of Energy
Section-C
Industrial Engineering, Plant layout, Production Management, Work Study, Inspection and Quality Control, Manufacturing Processes/Technologies, Machining Science, Measurement Techniques, Industrial Automation, Material Science and Metallurgy.
Entrance test exam for admission to **ME (CAD/CAM Engineering)** *shall consist of 50 questions from section-A and 25 questions from section B and C.*
Entrance test exam for admission to **ME (Thermal Engineering)** *shall consist of 50 questions from section-B and 25 questions from section A and C.*
Entrance test exam for admission to **ME (Production Engineering)** *shall consist of 50 questions from section-C and 25 questions from section A and B.*

STRUCTURAL ENGINEERING

Basic Structural Mechanics: Bending moment and shear force diagrams. Analysis of pinjointed and rigid plane frames. Influence lines, Analysis of axially loaded and eccentrically loaded columns. **Concrete Technology:** Concept of quality control. Concrete making materials. Properties of fresh and hardened concrete. Methods of concrete mix design. **Reinforced Concrete:** Limit state design methods for flexure, shear, bond and torsion. Design of basic elements using IS: 456-2000. **Design of Steel Structures:** Design of tension and compression members. Design of beams and columns (including bases and foundations). Welded and riveted joints. **Introduction to pre-stressed concrete.**

CIVIL INFRASTRUCTURE ENGINEERING

Structures: Free Body Diagrams, bending moments and shear forces in statically determinate beams, analysis of statically determinate and indeterminate structures, influence lines for determinate and indeterminate structures -- basic concepts of matrix methods of structural analysis. Basic working stress and limit states design concepts for design of concrete structures subject to flexure, shear, compression and torsion (beams, columns isolated footings). Analysis and design of steel structures in tension and compression, beams and beam-columns, column bases -- connections - simple and eccentric, beam-column connections, plastic analysis of beams and frames.

Geotechnical Engineering: Origin of soils, soil classification, fundamental definitions, relationship and inter-relationships, permeability and seepage, effective stress principle: consolidation, compaction, shear strength. Sub-surface investigation, earth pressure theories, foundation design requirements, bearing capacity, shallow and deep foundations, load capacity of piles in sands and clays.

Highway and Transportation Engineering: Highway planning, Geometric design of Highways, Testing and specifications of paving materials, Design of flexible and rigid pavements

Water Resources and Hydraulics: Fluid Mechanics and Hydraulics: Hydrostatics, applications of Bernoulli equation, laminar and turbulent flow in pipes, critical flow and gradually varied flow in channels, hydraulic jump, dimensional analysis and hydraulic modeling. **Hydrology:** Hydrologic cycle, rainfall, evaporation infiltration, unit hydrographs, flood estimation, reservoir design, reservoir and channel routing, well hydraulics. **Irrigation:** Irrigation methods, Duty, delta, estimation of evapo-transpiration, crop water requirements, design of lined and unlined canals, head works, design of weirs on permeable foundation Gravity dams, Ogee spillways, Earth dams.

ELECTRONICS & COMMUNICATION ENGINEERING/ WIRELESS COMMUNICATIONS

Networks : Network graphs; ,matrices associated with graphs, incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Norton's Maximum Power Transfer, Wye-Delta Transformation Steady state sinusoidal analysis using phasors. Fourier series. Linear constant coefficient differential and difference equations; time domain analysis of simple RLC circuits. Laplace and Z transforms; frequency domain analysis of RLC circuits. Convolution 2 port network parameters driving point and transfer functions. State equations for networks. **Analog Circuits:** Characteristics and equivalent circuits (large and small signal) of diodes, BJTs, JFETs and MOSFETs Simple diode circuits : clipping, clamping, rectifier Biasing and bias stability of transistor and FET amplifiers. Amplifiers : single and multistage, differential, operational; feedback and power. Analysis of amplifiers; frequency response of amplifiers. Simple op-amp circuits. Filters Sinusoidal oscillators: criterian for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits Power supplies. **Digital Circuits:** Boolean algebra; minimization of Boolean functions; logic gates, Digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinational circuits; arithmetic circuits, code converters, multiplexers and decoders. Sequential circuits; latches and flip-flops, counters and shift registers. Comparators, timer, multivibrators. Sample and hold circuits, ADCs and DACs. Semiconductor memories Microprocessor :8085/8086; architecture, AL programming, memory and I/O interfacing. **Communication System:** Fourier analysis of signals amplitude, phase and power spectrum, Autocorrelation and cross-correlation and their Fourier transforms. Signal transmission through linear time-invariant (LTI) system, impulse response and frequency response, group delay and phase delay. Analog modulation systems-amplitude and angle modulation and demodulation systems, spectral, analysis of operations, superheterodyne receivers, elements of hardware realizations of analog communication systems. Basic sampling theorem. Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM). **Digital Modulation Scheme :** amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK). Multiplexing time division and frequency division, Additive Gaussian noise characterization using correlation. Probability density function (PDF), power spectral density (PSD). Signal to noise ratio (SNR) calculation for amplitude modulation (AM) and frequency (FM) for low noise conditions. **Electromagnetism :** Elements of vector calculus : gradient, divergence and curl; Gauss' and Strokes' theorems, Maxwell's equations : differential and integral forms. Wave equation. Pointing vector Plane waves :

propagation through various media; reflection; phase and group velocity; Skin depth Transmission lines : Characteristics impedance; impedance transformation, Smith Chart, Impedance matching pulse excitation. **Waveguides :** Modes in rectangular waveguides; Boundary conditions; Cut-Off frequencies; Dispersion relations. **Antennas:** Dipole antennas; antenna arrays; radiation pattern; reciprocity theorem; antenna gain.

INFORMATION SECURITY

Section-I: Logical Reasoning & Analytical Ability

Section-II: Mathematical Foundations of Computer Science

Mathematical Logic: Prepositional logic, first-order logic, **Probability:** Random variables and expectation, conditional probability, independent random variables, frequency distributions; **Discrete Mathematics:** Sets, relations, functions, groups, lattices, boolean algebra, induction, recurrence relations; **Combinatorics:** Permutations, combinations, counting, summation; **Elementary Graph Theory:** Basic properties, graph traversals, topological sort, spanning tree, shortest paths; **Computational Techniques:** Solution of non-linear equations, elementary concepts of linear and matrix algebra, solution of system of linear equations, curve fitting and interpolation, numerical differentiation and integration, regression and correlation analysis; **Theory of Computation:** Regular languages and finite automata, context free languages and pushdown automata, Turing machines.

Section III: Computer Hardware

Digital Logic: Logic functions, minimization, design and synthesis of combinational and sequential circuits; **Number Representation and Computer Arithmetic**; **Computer Organization:** Machine instructions and addressing modes, ALU and data-paths, hardwired and micro-programmed control, memory interface, I/O interfaces, serial communication interface, instruction pipelining, cache, main and secondary storage.

Section IV: Software Systems

Programming Methodology: C programming, program control, functions, recursion, scope, binding, parameter passing, pointers, array handling, structures and unions, file handling, elementary concepts of Object Oriented, Functional and Logic Programming; **Data Structures:** Notion of abstract data types, stacks, queues, linked lists, trees, heap, graphs; **Algorithms for Problem Solving:** Tree and graph traversals, connected components spanning trees, shortest paths, hashing, sorting, searching; design techniques; **Complier Design:** Lexical analysis, parsing, syntax directed translation, runtime environment, code generation, linking; **Operating Systems:** Classical concepts (concurrency, synchronization, deadlock), processes, threads and inter-process communication, CPU scheduling, memory management, file systems, I/O systems, protection and security; **Database Systems:** Relational model, ER diagram, relational algebra, database design, normalization, SQL, file structures, transactions management and concurrency control; **Computer Networks:** ISO/OSI stack, sliding window protocol, LAN technologies (Ethernet, Token ring), TCP/UDP, IP, Basic concepts of switches, gateways and routers.

ELECTRONIC INSTRUMENTATION & CONTROL ENGINEERING

Mathematical Principles: Laplace and Fourier transform, Theory of maxima & minima.
Electrical Principles: Kirchoff's laws, Norton/Thevenin theorem, Current- voltage transformation, Ideal current source, Ideal voltage source. **Electronic Principles:** Zener/Avalanche breakdown, Basic Transistor Operation, Biasing Circuits, SCR, MOSFET, Oscillator & Amplifier Principles, Op-Amps, their applications, Logic gates, Flip flops,

Timers, Counters & Registers. **Microprocessor :** 8085 & 8086 architecture, Addressing modes of 8085 & 8086, Mnemonics, Basic programming, RS-232 protocol. **Electrical Measurements:** PMMC, moving iron Galvanometer, Electro dynamometer, Wattmeter, Wheat-stone Bridge, Maxwelll Bridge, De-saute's, Bridge, Current & Voltage transformer, Q-meter, Distortion meter, digital Voltmeter, CRO-analog & digital. **Generalized Measurement Systems:** Generalized impedance & stiffness concepts, Static-response of step & ramp signals to 1st & 2nd order systems, Loading effects, Analogies. **Signal Conditioning & Display :** Filters-active & passive, Dead time elements, LED/LCD. **Process Modelling & Control :** Lumped & Distributed parameters, interacting & non interacting systems, Concept of feedback & fed forward control, Actuators like Relay, Stepper motor, Servo motor, Pneumatic valves. **Industrial Measurements:** Principles of Level, Flow, Pressure, Temperature and Vibration measurements. **Analytical & Biomedical Instrumentation:** Principles of UV, Visual Spectroscopy, chromatographic techniques, Thermography & ultrasonography Cardiovasular Measurements.

POWER SYSTEMS

Power Systems : Transmission line - performance, models, Cables, Electrical & mechanical design of transmission line, Load flow and solution techniques, Symmetrical and unsymmetrical faults, Insulators, Circuit breakers, Electromechanical relays, Static relays, Protection schemes for feeders, generators, motors and transformers. High Voltage AC, DC and Impulse voltages generation and measurement; breakdown in solid, liquid and gases, Transient phenomenon in power systems.

Electrical Machines & Drives : Electromechanical energy conversion principals; construction, operation and performance of Transformer and rotating electrical machines, Drives – Basics, starting, speed control, braking through conventional and static drives.

Networks : Network Topology, Network Theorems, Circuit transients, Laplace transforms, Single and Three phase system, Fourier analysis, Magnetic circuits, Two port Network, Network Synthesis.

Electronics : Diode and Transistor, Operational Amplifiers, Oscillators: Boolean algebra; logic and sequential circuits : registers, counters, flip flops, Semiconductor memories, Microprocessor (8085), architecture, programming, memory and 1/0 Interfacing; Thyristors and power converter.

2   MTech PROGRAMMES (REGULAR)

METALLURGICAL & MATERIALS ENGINEERING

Bonding in solids, electronic configurations, ionic, covalent, metallic and secondary bonds. Space lattice and unit cells; crystal systems; indices for planes and directions; effect of radius ratio on coordination; structures of common metallic, semiconducting, polymeric, ceramic, amorphous/glassy materials. X-ray diffraction, Bragg's law, use of x-ray diffraction for the determination of simple crystal structures; Point, line and surface defects; geometry of edge and screw dislocations; Burger's vector; energy of dislocations; First and second Fick's laws of diffusion and their solutions under simple boundary conditions; Solid solutions; intermediate phases and intermetallic compounds; Gibbs' phase rule; unary and binary phase diagrams; iron-iron carbide phase diagram; Phase transformations; nucleation and growth; solidification; crystal growth and zone refining; precipitation hardening; recrycstallization and grain growth; martensitic transformations; Elastic behaviour of materials including composite, atomic models of

elasticity, rubber-like elasticity; Plastic deformation; slip systems in crystals; critical resolved shear stress; strengthening mechanisms; ductile and brittle fracture; Griffith's criterion, mechanisms of creep; fatigue; Polymeric materials; polymerization, cross-linking; glass transition; composites; Absorption, oxidation and corrosion; Thermal properties of materials, specific heat, thermal conductivity, thermoelectricity; Electrical/electronic behaviour of materials; electrical conductivity; free electron and band theory of solids; intrinsic and extrinsic semiconductors; p-n junctions; solar cells; superconductivity; type I and II superconductors and their applications; Dielectric behaviour of materials; polarization phenomena; spontaneous polarization; dielectric constant and loss; piezo - and Ferro electricity; Magnetic behaviour of materials; dia-, para-, ferro and ferrimagnetism; soft and hard magnetic materials and their applications; Optical properties of materials; refractive index, absorption and emission of light; optical fibres, lasers and optoelectronic materials.

ENVIRONMENTAL SCIENCE & TECHNOLOGY

Interactions between humans and environment; The physical environment- land water, and climate; Resources and their management- Natural, Technological and Human; Concept of sustainability- Natural ecosystems and sustainability; Agricultural and Industrial systems from the angles of environment protection; Environmental Chemistry- Analytical Techniques and instrumentation; Atmospheric Chemistry; Basic Microbiology- nature and extent of microbial world; growth and energetics, Microbiology of water and wastewater; Microbial Corrosion and biofouling; Quantity of Water- per capita demand, factor affecting the demand; Quality of water- physical, chemicals and biological characteristics, Treatment of water- Sedimentation, Coagulation; filtration; Chlorination; absorption; adsorption, and Miscellaneous methods; Sewage and sewerage systems; Primary and Secondary treatment of sewage- aerobic and anaerobic processes and their applications in the wastewater treatment.

VLSI DESIGN

Logical and Analytical Ability; Fundamentals of Computer and C programming: Basics of Computers; Operators, Data types, Expression, Control Flow statement, Functions, Arrays, Strings, pointers, structures, and unions. **Data Structures and Algorithms:** Data types, structures, stacks, queues, and linked lists. Sorting and Searching, B-trees, B+ trees and hashing. **Networks :** Network graphs; ,matrices associated with graphs, incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Norton's Maximum Power Transfer, Wye-Delta Transformation Steady state sinusoidal analysis using phasors. Fourier series. Linear constant coefficient differential and difference equations; time domain analysis of simple RLC circuits. Laplace and Z transforms; frequency domain analysis of RLC circuits. Convolution 2 port network parameters driving point and transfer functions. State equations for networks. **Semiconductor Devices and Analog Circuits :** Characteristics and0020equivalent circuits (large and small signal) of diodes, BJTs, FETs, JFETs, MOSFETs, UJT, SCR, photodiode, phototransistor, etc. Simple diode circuits; clipping, champing, rectifier, biasing and bias stability of transistor and FET amplifiers. Amplifiers : single and multistage, differential, operational, feedback and power, Analysis of amplifiers. Amplifiers : frequency response of amplifiers, simple op-amp circuits. Sinusoidal Oscillators: criterion for oscillation; op-amp configurations. Function generators and wave shaping circuits. Regulated power supplies. **Digital Circuits :** Number Systems, Fixed-point and floating number representations, Boolean Algebra, Demorgan's therorems, minimization of Boolean functions, logic gates, digital logic families (DTL, TTL, ECL, MOS, CMOS), Combinational circuits, arithmetic circuits, code converter, multiplexers and decoders; sequential circuits : latches and flipflops,

Registers, Counters, Comparators, timers, multivibrators; Sample and hold circuits, ADCs and DACs; Semiconductor memories. **Microprocessors :** Evolution, microcomputer architecture; Intel 8085: architecture, addressing mode, Instruction set, programming technique, Interrupt Structure; Intel 8086: architecture, concept of segmented memory, addressing modes, Instruction set, programming techniques, Interrupt Structure; Interfacing devices i.e. 8255,8279,8257,8253,8259etc.: memory and I/O interfacing, read/write timing diagrams. **Computer Architecture :** Basic computer organization and Design, memory organization, I/O organization, I/O Devices, Data transfer techniques, Register transfer Language Microprogrammed control, CPU, Concept and CISC and RISC architecture.

CHEMICAL ENGINEERING

Process Calculations and Thermodynamics: Laws of conservation of mass and energy; degree of freedom analysis, first and second laws of thermodynamics and their applications; phase equilibria; chemical reaction equilibria. **Fluid Mechanics and Mechanical Operations**: Fluid statistics, Bernoulli equation, macroscopic friction factors, dimensional analysis, flow through pipeline systems, flow meters pumps and compressors, packed and fluidized beds, size reduction and size separation, free and hindered settings, centrifuges and cyclones; thickening, filtration, mixing and agitation, conveying. **Heat Transfer**: conduction, convection, radiation, heat exchangers, evaporators. **Mass Transfer**: Ficks' law, molecular diffusion in fluids, distillation, absorption, adsorption, drying, **Chemical Reaction Engineering**: Kinetics of homogeneous reactions, interpretation of kinetic data, residence time distributions, kinetics of heterogeneous catalytic reactions; diffusion effects in catalysts. **Instrumentation and Process Control**: Dynamics of simple systems, controller modes (P, PI and PID). **Plant Design and Economics**: Design and sizing of chemical engineering equipment, principles of process economics and cost estimation. **Chemical Technology**: Inorganic chemical industries, sulfuric acid, NaOH, fertilizers (Ammonia, Urea, SSP and TSP); organic chemical industries Pulp and Paper, Sugar, Oil and Fats; petroleum refining and petrochemicals, polymerization industries: - polypropylene, PVC and polyester synthetic fibers. **Process modeling and simulation:** Equation of continuity, momentum, energy, Models for Reactors, heat exchangers, distillation**,** Columns**,** **Computational methods in chemical engineering:** PDE, ODE, use of excel sheet, MATLAB, **Differential Equations**: First order (Linear and nonlinear), Laplace transforms, **Numerical Methods**: Numerical solutions of linear and non linear algebraic equations, integration by trapezoidal and Simpson's rule, single and multi-step methods of differential equations **Probability and Statistics**: Mean median mode and standard deviation, random variables, Poisson, normal and binominal distributions.

COMPUTER APPLICATIONS

Section-I: Analytical Ability (20 Marks)

The questions in this section will cover logical reasoning, quantitative reasoning, and visual-spatial reasoning.

Section-II: Mathematical Aspects of Computer Science (40 Marks)

Combinatorics : Permutations, combinations, counting, summation;

Theory of Probability : Axiomatic definition of Probability, conditional probability, Baye's Theorem : random variables, Functions of random variables. Expectation, Probability distributions: Binomial Poisson, Exponential and Nomial distribution and their moment generating functions.

Discrete Mathematics : Sets, relations, functions, lattices, Boolean algebra, induction, recurrence relations.

Groups, Subgroups, Homomorphisms, Normal and subnormal subgroups.

Linear Algebra:
Review of matrices, Consistency of system of Linear equations. Vector spaces and subspace, linear independence and dependence of vectors, Basis and dimensions. Rank and nullity of a linear transformation, Eigen values and eigenvectors of a Matrix, diagonalization.

Optimization Techniques
Linear Programming : Graphical method, Simplex method, Duality Theory and Sensitivity Analysis.
Transportation and Assignment Problem: Initial Basic Feasible Solutions of Balanced and Unbalanced Problems, Optimal Solutions.
Network Analysis : Shortest Path problem. Minimum Spanning Tree Problem. Maximum Flow Problem. Minimum Cost Flow Problem.

Numerical Techniques : Number systems, Solution of non-linear equations, solution of system of linear equations, curve fitting, interpolation, numerical differentiation and integration, solutions of IVP.

Section III: Concepts of Computer Science (40 Marks)
Number Representation and Computer Arithmetic

Computer Organization : Machine instructions and addressing modes, ALU and data-paths, hardwired and micro-programmed control pipelining , memory interface, I/O interfaces, serial communication interface, parallel processing, memory management

Structured and object oriented programming concepts (with reference to "C/ C++"):
Program control, functions, recursion, scope, binding, parameter passing, pointers, array handling, structures and unions, file handling, concepts of Object Oriented Programming.

Data Structures : Notion of abstract data types, stacks, queues, linked lists, trees, heap, graphs, Tree and graph traversals, hashing, sorting, searching.

Theory of Computation : Regular languages and finite automata, context free languages and pushdown automata, Turing machines.

Complier Design : Lexical analysis, parsing, syntax directed translation, runtime environment, code generation, linking.

Operating Systems: Definition and significance of OS, OS as resource manager, Classical concepts processes, concurrency, synchronization, deadlock, threads and inter-process communication, CPU scheduling, memory management, file systems, I/O systems, protection and security, DOS, UNIX and windows.

Database Management Systems: Relational model, ER diagram, relational algebra, database design, normalization, SQL, transactions management and concurrency control.

Computer Networks: OSI reference model, sliding window protocols, LAN technologies (Ethernet, Token ring), TCP/UDP, IP, , Networking addresses, transmission medias, Networking devices-Hub, switches. gateways and routers.

Software Engineering: Basics of s/w engineering, Software Process models, software project planning and management.

BIOTECHNOLOGY
Microbiology: Prokaryotic and eukaryotic cell structure; Microbial nutrition, growth and control; Microbial metabolism (aerobic and anaerobic respiration, photosynthesis); Nitrogen fixation; Chemical basis of mutations and mutagens; Microbial genetics (plasmids, transformation, transduction, conjugation); Microbial diversity and characteristic features; Viruses.

Biochemistry: Biomolecules and their conformation; Ramachandran map; Weak inter-molecular interactions in biomacromolecules; Chemical and functional nature of enzymes; Kinetics of single substrate and bi-substrate enzyme catalyzed reactions; Bioenergetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; Cell cycle and cell growth control; Cell signaling and signal transduction; Biochemical and biophysical techniques for macromolecular analysis

Molecular Biology and Genetics: Molecular structure of genes and chromosomes; DNA replication and control; Transcription and its control; Translational processes; Regulatory controls in prokaryotes and eukaryotes; Mendelian inheritance; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extrachromosomal inheritance; Chromosomal variation; Population genetics; Transposable elements, Molecular basis of genetic diseases and applications

Process Biotechnology: Bioprocess technology for the production of cell biomass and primary/secondary metabolites, such as baker's yeast, ethanol, citric acid, amino acids, exopolysacharides, antibiotics and pigments etc.; Microbial production, purification and bioprocess application(s) of industrial enzymes; Production and purification of recombinant proteins on a large scale; Chromatographic and membrane based bioseparation methods; Immobilization of enzymes and cells and their application for bioconversion processes. Aerobic and anaerobic biological processes for stabilization of solid / liquid wastes; Bioremediation.

Bioprocess Engineering: Kinetics of microbial growth, substrate utilization and product formation; Simple structured models; Sterilization of air and media; Batch, fed-batch and continuous processes; Aeration and agitation; Mass transfer in bioreactors; Rheology of fermentation fluids; Scale-up concepts; Design of fermentation media; Various types of microbial and enzyme reactors; Instrumentation in bioreactors.

Plant and Animal Biotechnology: Special features and organization of plant cells; Totipotency; Regeneration of plants; Plant products of industrial importance; Biochemistry of major metabolic pathways and products; Autotrophic and heterotrophic growth; Plant growth regulators and elicitors; Cell suspension culture development: methodology, kinetics of growth and production formation, nutrient optimization; Production of secondary metabolites by plant suspension cultures; Hairy root cultures and their cultivation. Techniques in raising transgencies.

Immunology: The origin of immunology; Inherent immunity; Humoral and cell mediated immunity; Primary and secondary lymphoid organ; Antigen; B and T cells and Macrophages; Major histocompatibility complex (MHC); Antigen processing and presentation; Synthesis of antibody and secretion; Molecular basis of antibody diversity; Polyclonal and monoclonal antibody; Complement; Antigen-antibody reaction; Regulation of immune response; Immune tolerance; Hyper sensitivity; Autoimmunity; Graft versus host reaction.

Recombinant DNA Technology: Restriction and modification enzymes; Vectors: plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; cDNA and genomic DNA library; Gene isolation; Gene cloning; Expression of cloned gene; Transposons and gene targeting; DNA labeling; DNA sequencing; Polymerase chain reactions; DNA fingerprinting; Southern and northern blotting; In-situ hybridization; RAPD; RFLP; Site directed mutagenesis; Gene transfer technologies; Gene therapy.

Bioinformatics: Major bioinformatics resources (NCBI, EBI, ExPASy); Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, scoring matrices, sequence alignment, phylogeny); Genomics and Proteomics (Large scale genome sequencing strategies; Comparative genomics; Understanding DNA microarrays and protein arrays); Molecular modeling and simulations (basic concepts including concept of force fields).

Plant Sciences: Plant cell structure, organization, organelles, cytoskeleton, cell wall and membranes; anatomy of root, stem and leaves, meristems, vascular system, their ontogeny,structure and functions, secondary growth in plants and stellar organization; Plant water relations, transport of minerals and solutes, stress physiology, stomatal physiology, signal transduction, N2 metabolism, photosynthesis, photorespiration; respiration ; Flowering: photoperiodism and vernalization, biochemical mechanisms involved in flowering; molecular mechanism of senencensce and aging, biosynthesis, mechanism of action and physiological effects of plant growth regulators, Principles of Mendelian inheritance and linkage. Principles, methods - selection, hybridization, heterosis; male sterility, genetic maps and molecular markers, sporophytic and gametophytic self incompability, haploidy, triploidy, somatic cell hybridization, A general account of economically and medicinally important plants; Nature and classification of plant diseases; plant-microbe beneficial interactions diseases of important crops caused by fungi, bacteria and viruses, and their control measures, mechanism(s) of pathogenesis and resistance, molecular detection of pathogens; Ecosystems - types, dynamics, degradation, ecological succession; food chains and energy flow.

Animal Sciences: Broad classification of Animals, Origin and history of life on earth, theories of evolution, natural selection, adaptation, Speciation, Comparative physiology, the respiratory system, circulatory system, digestive system, the nervous system, the excretory system, the endocrine system, the reproductive system, the skeletal system, osmoregulation Nature of parasite, host-parasite relation Embryonic development, cellular differentiation, organogenesis, metamorphosis, genetic basis of development, stem cells. Metabolism, regulation and nutritional requirements for mass cultivation of animal cell cultures; Kinetics of cell growth and product formation and effect of shear force; Product and substrate transport; Micro & macro-carrier culture; Hybridoma technology; Live stock improvement; Cloning in animals; Genetic engineering in animal cell culture; Animal cell preservation.

ENERGY TECHNOLOGY AND MANAGEMENT

Analytical, quantitative and verbal aptitude; Energy resources (conventional and new/renewable); Earth and solar radiation; Units and conversions; Thermodynamics and heat transfer; Materials and energy balance; Fluid mechanics and fluid machinery; Fuels and combustion; Energy conversion technologies; Steam; Hydrogen fuel; Energy storage; Electricity and power systems; Energy crisis; Energy and environment; Energy, global warming and climate change; Energy policy and legislation; Energy conservation and management.