



# Manipur Technical University

(A University created by the Manipur Technical University Act, 2016)

Takyelpat, Imphal West, Manipur – 7950 004

MANIPUR TECHNICAL UNIVERSITY

Information Brochure  
for B. Tech.  
Programme 2017 – 18  
(For Lateral Entry)



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## Information Brochure for B. Tech. Programme, 2017-18 (For Lateral Entry)



**Contents**

Objects of the University .....4

**Manipur Technical University – A Ragging Free University .....5**

    Important Instructions for the Students ..... 5

    Students’ Code of Conduct ..... 5

**Important Functionaries of the University.....6**

**About the University.....8**

    Introduction..... 8

    Location..... 8

**Facilities and Services .....9**

    University Library ..... 9

    Computing Facilities..... 9

    Residence Facility (Hostel Accommodation)..... 9

    Health Care ..... 9

    Games and Sports ..... 10

**Instruction Methodology..... 10**

**Training and Placement .....10**

**Academic Calendar..... 10**

**Course Registration and Attendance .....11**

    Course registration..... 11

    Attendance requirement..... 11

    Academic Session..... 11

        Abridged Academic Calendar 2017-18 (Tentative)..... 11

**Civil Engineering..... 13**

    Programmes offered..... 13

**Computer Science and Engineering ..... 13**

Programmes offered.....	13
<b>Electronics and Communication Engineering .....</b>	<b>14</b>
Programmes offered.....	14
<b>Electrical Engineering.....</b>	<b>14</b>
Programmes offered.....	14
<b>Mechanical Engineering .....</b>	<b>15</b>
Programmes offered.....	15
<b>Distribution of Seats for B.Tech (3rd Semester), 2017-18 for Lateral Entry .....</b>	<b>17</b>
<b>Eligibility for Admission .....</b>	<b>17</b>
Date of Birth.....	17
<b>Selection Procedure .....</b>	<b>18</b>
<b>Short-listing .....</b>	<b>29</b>
<b>Admission .....</b>	<b>29</b>
Refund of Caution Deposit.....	29
<b>How to Apply.....</b>	<b>30</b>
Documents to be submitted along with the application form .....	30
<b>ANNEXURE – I .....</b>	<b>32</b>
Important Dates.....	32
<b>ANNEXURE – II.....</b>	<b>33</b>
Fee Structure for Admission .....	33
Academic Fees:.....	33
Residence Fees: .....	34

## Objects of the University

*"To disseminate, create and preserve the knowledge in the field of technical education for the advancement of mankind and understanding by teaching, training, and research."*



MANIPUR TECHNICAL UNIVERSITY

## Manipur Technical University – A Ragging Free University

According to “The UGC Regulations on curbing the menace of Ragging in Higher Educational Institutions, 2009”, the definition of ragging includes, among other things, one or more of the following acts: any conduct which has the effect of teasing whether by words spoken or written or by an act; treating or handling any other student with rudeness; indulging in rowdy or undisciplined activities which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in a fresher or a junior student; asking a student to do any act or perform something which such student will not do in the ordinary course and which has the effect of causing or generating a sense of shame or embarrassment so as to adversely affect his physique or psyche.

### IMPORTANT INSTRUCTIONS FOR THE STUDENTS

- According to Hon'ble Supreme Court of India, ragging in educational institutions is banned.
- Ragging is a cognizable offence.
- Students are advised not to indulge in ragging.
- Ragging entails heavy fines and/or suspension/expulsion.
- Ragging is an undesirable social offence, which is totally banned in the university campus.
- In case the applicant for admission in the institute is found to have indulged in ragging in the past or if it is noticed that he/she has indulged in ragging, admission may be refused or he/she shall be expelled from the university.
- In case of ragging, please do not keep quiet, report it to the authorities immediately.
- It is mandatory for the parents to report immediately to the authorities of the university in case their wards inform them about ragging.

### STUDENTS' CODE OF CONDUCT

The students must strictly follow the code of conduct as laid down by the University from time to time. Violation of any clause by any student will attract disciplinary action as per the regulations.

## Important Functionaries of the University

NAME	DESIGNATION	EMAIL ID
W. Malemnganba Chenglei	Registrar	w.m.chenglei@gmail.com
Vivek Elangbam	Finance Officer	velangbam@gmail.com
Peter Salam	Assistant Registrar	petersalam@gmail.com
P. Shantikumar Singh	Assistant Registrar	pangambams@gmail.com
K. Kenish Sharma	Asst. Finance Officer	kenishsharma@gmail.com



**SECTION ONE**  
**The University**



MANIPUR TECHNICAL UNIVERSITY



# About the University

## Introduction

The Manipur Technical University was established on 23<sup>rd</sup> April, 2016 by an Act of the Government of Manipur –“The Manipur Technical University Act, 2016” (Manipur Act No. 8 of 2016). It is located at Takyelpat, Imphal West District, Manipur. The Manipur Technical University is the only technical university of the State of Manipur. All the technical institutions of the State are to be affiliated to the University in due course of time. At present the University offers B. Tech. courses in Civil Engineering, Electrical Engineering, Mechanical Engineering, Electronics & Communication Engineering and Computer Science and Engineering.

The University has engaged itself in the process of capacity building, both in terms of infrastructure and human resource development. The University has mounted tremendous efforts in developing it into a modern university incorporating all elements from the contemporary scientific and socio-cultural milieu. The University will have good laboratories, computing facilities, internet connectivity, a dedicated power supply system and a rich library having connectivity to several digital libraries. While students’ accommodation will be provided in separate gents and ladies hostels, several residential quarters will be built for accommodating teachers and non-teaching staff. Other basic amenities like Wi-Fi facility, Water supply, Campus security with CCTV cameras, Canteen, Gymnasium, Outdoor & Indoor Sports Facilities, Banks, etc. will be available to cater to the various needs of the University community.

The University attracts outstanding faculty members of different Departments from all across the country. Special efforts are made by the University to encourage the Faculty Members in conducting outstanding research. The University endeavours to collaborate with prestigious Industries to promote industry sponsored projects and meaningful research.

## Location

The university campus is located at Imphal, the capital city of Manipur at a distance of about 5 kms on the National Highway – 37 from the heart of Imphal City. The sprawling, serene and green University Campus provides the best of atmosphere including modern infrastructure conducive for dedicated research and learning. At present classes of all branches will be held at the campus of State Academy of training (SAT), Takyelpat and Government Polytechnic, Manipur.

## Facilities and Services

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The University has the following facilities and services for the students and research scholar:

### University Library

The University Library have a good collection of books which will be subsequently upgraded to a world class library with a large collection of books, periodicals and journals with many in electronic form. All the necessary books will be made available in the library. The catalogue of books and journals will be available for users for online access on the campus network.

### Computing Facilities

The University will have elaborate computing facilities accessible to the students and scholars. The computer facilities will be provided in a dedicated Computer Lab and the Library with common desktop applications and specialist software in the computers such as Microsoft Office, Microsoft Outlook, Quantitative Analysis & Qualitative Analysis software etc. There will also be a dedicated IT Help Desk for the benefit of Staff Members and Students. Computing Facilities with 24x7 internet facilities will be provided in the hostels.

### Residence Facility (Hostel Accommodation)

The University will have separate residence facilities (Hostels) for men and women to accommodate all the students. The Hostels will possess all the necessary modern amenities. At present hostel accommodation is provided to a limited number of students.

### Health Care

The University has a Health Centre to provide basic medical services with its own medical and paramedical staff. It is being planned to provide students with the benefit of a group health insurance scheme.

### Games and Sports

The University provides opportunities for students to excel in various departments of sports. The University will have facilities that include Indoor Stadium, Volleyball, Cricket and Football grounds with playing facilities under flood light and a well-equipped multi Gymnasium.

## Instruction Methodology

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The medium of instruction / examination in the University at all levels is English. In framing the courses, care has been taken to see that they are not burdened with formal lectures only. There is adequate provision for seminars, tutorials etc. to promote the habit of independent thinking and application of the concepts taught in the lectures. To relate theoretical knowledge to the practical field, proper measures are taken to conduct case studies and guided field works. Group Discussion is an integral part of teaching pedagogy to help the students in increasing their analytical capability and creativity.

## Training and Placement

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One of the unique features of the University is its commitment not only to produce quality manpower, but also to guide and shape the career of students. In order to meet this objective, the University will have a *Training and Placement Cell* which will act as the interface between the recruiting organizations and the University students. It will facilitate recruitment events on-campus as well as off-campus as required. It will also organize with the help of the Departments concerned various pre-placement training programmes to enhance the employability of the targeted students.

## Academic Calendar

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The university strictly adheres to a well-planned Academic Calendar specifying the schedule of academic activities. Detailed academic calendar will be made available in the University website as well as in the Departments.

## Course Registration and Attendance

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### Course registration

The Courses opted by the students in a particular semester are to be registered on the specified date(s). For newly admitted students, registration of Courses shall take place during the time mentioned in “Important Dates” in **Annexure -I** along with the admission formalities.

### Attendance requirement

All students must attend at least 75 % of the total classes of the course registered by him/her. However, to account for late registration, sickness or other such contingencies, the attendance requirement may be given some relaxation on production of valid documents/certificates. Students with deficiency in attendance in a course will not be allowed to appear in the Semester-end Examination except under relaxation mentioned above.

### Academic Session

An academic year of the University consists of two Semesters - Autumn (August to January) and Spring (February to July).

#### Abridged Academic Calendar 2017-18 (Tentative)

First year

Semester	Commencement of classes	End of classes
First Semester	1 <sup>st</sup> August	30 <sup>th</sup> November
Second Semester	1 <sup>st</sup> January	30 <sup>th</sup> April

Second year onwards

Semester	Commencement of classes	End of classes
Odd Semester	15 <sup>th</sup> July	15 <sup>th</sup> November
Even Semester	15 <sup>th</sup> December	15 <sup>th</sup> April

*NOTE: Detailed academic calendar will be made available on the University website as well as in the Departments.*



# SECTION TWO

# Departments

In this section, a brief idea on the Departments of the University is given.

For detailed information, the reader can visit the University website at [www.mtuonline.in](http://www.mtuonline.in) or [www.mtu.ac.in](http://www.mtu.ac.in) and follow the appropriate links of each Department.

## Civil Engineering

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The department of Civil Engineering of the Manipur Technical University is established in the year 2016 under the School of Engineering for offering B. Tech. Degree. The Department aims to provide quality educational research and professional experiences in many fields including design of steel structures, hydraulic structures, transportation engineering, hydrology and water resources engineering, geotechnical engineering, fluid mechanics, reinforced concrete design etc. The Department offers a 4 years B. Tech. Course in Civil Engineering with an intake of 30 students.

### Programmes offered

- 4 years B. Tech. Course in Civil Engineering.

## Computer Science and Engineering

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The Department of Computer Science and Engineering is established in the year 2016. The Department aims to provide quality educational research and professional experiences in the fields of computational theory, computer networks, network security, mobile computing, soft computing and data mining, natural language processing, workflow management, qualitative spatial reasoning, web services, rehabilitation robotics, and pattern recognition. The students will study courses in programming and data structures, digital logic design, computer organization and architecture, design and analysis of algorithms, microprocessors and applications, operating systems, computer networks, data management system, software engineering, computer graphics etc. The Department offers a 4 years B. Tech. Course in Computer Science and Engineering with an intake of 30 students.

### Programmes offered

- 4 years B. Tech. Course in Computer Science and Engineering

## Electronics and Communication Engineering

The Department of Electronics and Communication Engineering is established in the year 2016. This course has been designed with the aim to meet industrial requirements in the field of Electronics and Communication with emphasis on latest technological developments including semiconductor devices, microprocessors, network theory, analogue and digital electronics, digital signal processing, VLSI, industrial electronics, communication systems and networks, antenna design, microwave engineering, communication networks etc. The Department offers a 4 years B. Tech. Course in Electronics and Communication Engineering with an intake of 30 students.

### Programmes offered

- 4years B. Tech. Course in Electronics & Communication Engineering

## Electrical Engineering

The Department of Electrical Engineering is established in 2016. The Course has been designed with the aim to meet industrial requirements in the field of Electrical with emphasis on latest technological developments including power systems, energy conversion system, solid state devices, electrical measurement and instruments, microprocessors & microcontrollers, digital signal processing etc. The Department offers a 4 years B. Tech. Course in Electrical Engineering with an intake of 30 students.

### Programmes offered

- 4 years B. Tech. Course in Mechanical Engineering

## Mechanical Engineering

The Department of Mechanical Engineering is established in 2016 under the School of Engineering for offering B. Tech degree in Mechanical Engineering with special emphasis on turbo machines, manufacturing processes and systems, design of machine elements, fluid systems, automobile engineering, refrigeration and air conditioning, industrial engineering and mechanical vibration etc. The Department offers a 4 years B. Tech. Course in Mechanical Engineering with an intake of 30 students.

### Programmes offered

- 4 years B. Tech. Course in Mechanical Engineering



MANIPUR TECHNICAL UNIVERSITY





**SECTION THREE**  
**Admission Procedure**



MANIPUR TECHNICAL UNIVERSITY

## Distribution of Seats for B. (Tech Third Semester), 2017-18 for Lateral Entry

Sl	Name of the Branch	No. of seats						Total
		UR	OBC			SC	ST	
			Meitei	Meitei Pangal	Nepali/Teli			
1	Civil Engineering	04	01	Nil	Nil	Nil	01	06
2	Electrical Engineering	04	01	Nil	Nil	Nil	01	06
3	Mechanical Engineering	04	01	Nil	Nil	Nil	01	06
4	Electronics & Communication Engineering	04	01	Nil	Nil	Nil	01	06
5	Computer Sc. & Engineering	04	01	Nil	Nil	Nil	01	06

### Eligibility for Admission

Applicants must have passed the diploma in Engineering in the relevant branch or degree in Bachelor of Science (**with Mathematics as a subject in the XII standard**), as the case may be, with a minimum of 45% marks (40% in case of candidates belonging to SC/ST/PWD categories) in the aggregate. Candidates who are awaiting final results of Diploma in Engineering/B. Sc. may also apply. They should, however, secure a minimum of 45% (40% in case of SC/ST/PWD categories) in the final result in aggregate.

Provided that the students belonging to B.Sc. Stream, shall clear the subjects Engineering Graphics/ Engineering Drawing and Engineering Mechanics of the first year Engineering Programme along with the second year subjects.

Provided, further, that the students belonging to B.Sc. Stream shall be considered only after filling the supernumerary seats in this category with students belonging to the Diploma stream.

#### Date of Birth

Only those candidates whose date of birth falls on or after 31.07.1991 are eligible for admission. For SC/ST and Persons with Disabilities (PWD) candidates, upper age limit is relaxed by 5 years. Date of birth as recorded in the Secondary Education Board certificate will only be considered.

## Selection Procedure

Selection of candidates in different streams will be done on the basis of an Entrance Test to be conducted by the University.

The questions in the Test will be of Multiple Choice type and it will consist of the following papers:

**PAPER-I:** *Basic Sciences (Physics, Chemistry and Maths.)* - 60 marks

**PAPER-II:** *The relevant Engineering Subject* - 40 marks

The syllabi of the Entrance Test are given below:

### 1. PHYSICS:

**Waves and oscillation:** Simple harmonic motion –, superposition of two simple harmonic waves, Lissajous figures, Damped vibration- Differential equation and its solution, logarithmic decrement, quality factor, Forced vibration – Differential equation and its solution, resonance, sharpness of resonance

**Quantum Physics: Particles and Waves-** Inadequacies in Classical Physics: Blackbody Radiation, Photoelectric Effect. Compton Effect. Wave Nature of Matter : De Broglie Hypothesis, Wave-Particle Duality, Davisson-Germer Experiment, Wave description of Particles by Wave Packets, Group and Phase Velocities, Wave Functions, Heisenberg's Uncertainty Principle, Failure of classical physics ,Compton effect , Pair production, De Broglie relation, Probability density, Schrodinger wave equation, expectation values and eigen-value equation, particle in a box, simple harmonic oscillator problem, concept of degeneracy.

**Electrodynamics: Electrostatics:** Gradient of a scalar, divergence and curl of a vector, Electric Field, Electric Flux, Gauss's law and applications, Electric Potential, Conservative Nature of Electrostatic Field, Electrostatic Potential Energy of a System of Charges, Electrostatic Energy, Dielectrics:- Electric Field in Matter. Dielectric Constant, Parallel Plate Capacitor with a Dielectric, Polarization, Polarization Vector, Electric Susceptibility, Gauss's law in Dielectrics, Displacement vector D.

**Magnetostatics:** Magnetic Flux, Biot-Savart's Law, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital law and its applications, Curl and Divergence of B, electromotive force, Faradays law, energy stored in magnetic field, continuity equation, derivation of Maxwell's equation, Wave equations, pointing theorem

**Applied optics: Lasers:** Einstein's A and B coefficients, Metastable states, Spontaneous and Stimulated emissions, Optical Pumping and Population Inversion, Three-Level and Four-Level Lasers, Ruby Laser and He-Ne Laser.

**Optical Fibers:** Classification of optical fibers, Refractive index profile, Step and Graded Indices (Definitions Only) Numerical aperture of optical fiber, Pulse dispersion in optical fiber (ray theory).

**Solid State Physics: Crystal structure:** Amorphous and Crystalline Materials, Lattice Translation Vectors, Lattice with a Basis, Unit Cell, Types of Lattices, Diffraction of x-rays by Crystals, Bragg's Law.

**Magnetic Properties of Matter-** Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Discussion of B-H Curve. Hysteresis and Energy Loss.

**Electrical Properties of Materials & semiconductors:** Elementary Band Theory of Solids, Concept of Holes, Band Gaps, Energy Band Diagram and Classification of Solids, Insulators, and Semiconductors, Direct and Indirect Band Gap, Concept of intrinsic and extrinsic semiconductors, p- and n- Type Semiconductors, Fermi level, Conductivity in Semiconductors, characteristics of PN Junction, static and dynamic resistance, zener diode and LED, diode as a rectifier, transistor (PNP and NPN) characteristics.

## 2. CHEMISTRY:

**Water and its Treatment:** Introduction, hardness of water, units of hardness, determination of hardness by EDTA Method.

**Disadvantages of hard water:** boiler scales and sludge.

**Boiler corrosion:** due to dissolve  $O_2$ , dissolve  $CO_2$ , dissolve salt and caustic embrittlement. Qualities of drinking water, treatment of water for municipal supply, lime-soda process, Zeolite method, ion exchange method.

**Desalination of water:** Reverse osmosis and electro dialysis.

**Electrochemical Energy Systems:**

**Electrode potential and cells-** Introduction, classification of cells-primary, secondary and concentration cells, reference electrodes: calomel electrode and Ag/AgCl electrode, ion-selective electrode- glass electrode, determination of pH using glass electrode, applications of these electrodes in determining strength of acids, bases and redox reactions, numerical problems

**Batteries:** Basic concepts, battery characteristics, classification of batteries—primary, secondary and reserve batteries, modern batteries - construction, working and applications of lead acid battery, nickel-metal hydride and Li-ions batteries,

**Fuel cells:** Introduction, types of fuel cells - alkaline, phosphoric acid, molten carbonate, solid polymer electrolyte and solid oxide fuel cells, construction and working of methanol-oxygen fuel cell, Photovoltaic cells, Dye Sensitised solar cell (DSSC).

**Polymer Chemistry:**

**Polymers-** Introduction, mechanism of coordination polymerization (Zeigler-Natta polymerization), methods of polymerization, structure and property relationship of polymers, number average molecular weight, weight average molecular weight and their determination.

**Plastics:** Definition of resins and plastics, compounding of resins to plastics, (moulding constituents), synthesis, properties and applications of PMMA and UF.

**Elastomers:** Synthesis and application of butyl rubber and nitrile rubber

**Adhesives:** Preparation and applications of epoxy resins.

**Conducting polymers:** Definition, structure, properties and mechanism of conduction in polyaniline and uses.

### **Engineering Materials:**

**Cement-** Composition and manufacture of Portland cement, harmful ingredients, setting and hardening of cement.

**Fuel-** Classification, calorific value (Bomb calorimeter), Coal: source, classification, carbonisation of coal.

**Petroleum-** Classification, different fractions and uses. Cracking of hydrocarbons, knocking and octane number, synthetic petrols and petrochemicals.

**Phase Equilibria: Phase rule-** Statement - explanation of the terms involved – Phase diagram study of one component system; phase diagram of water and carbon dioxide.

**Coordination chemistry:** Crystal field theory of octahedral, tetrahedral and square planar complexes; consequence of crystal field theory: High-spin, Low-spin complexes and the spectrochemical series; Colour of coordination complexes; Charge transfer spectra; Jahn-Teller effect, magnetic properties of coordination complexes.

**Spectroscopy analysis: Ultraviolet and Visible Spectroscopy-** Chromophore and Auxochrome, Electronic transitions, Structure determination and solvent effect, Woodward rule for calculating absorption maximum in dienes and Fluorescence spectroscopy.

**Infrared Spectroscopy:** Steady-state and time-resolved Infrared spectroscopy: from overview to potential applications.

**NMR Spectroscopy:** Introduction of theory,  $^1\text{H}$  and  $^{13}\text{C}$  NMR, Spin-Spin Coupling.

**Mass Spectroscopy:** Introduction of theory, ionization methods, molecule fragmentation. Introduction to Photoelectron spectroscopy. Introduction to atomic absorption spectroscopy (AAS).

**Fundamental of reaction mechanism:** Introduction, Homolytic and Heterolytic cleavages; free radicals, Carbocation, and Carbanions; Addition reactions, Elimination reactions and Substitution reactions.

### **3. MATHEMATICS:**

**Sequences and Series:** Convergence of sequences and series of real numbers. Infinite series, Tests for convergence of series (Comparison, Ratio, Root, Integral, Raabe's, logarithmic), Alternating series, Absolute convergence, Conditional convergence.

**Calculus of a single variable:** Continuity of functions; differentiability, Rolle's theorem, mean value theorem, Taylor's theorem, Taylor's & Maclaurin's expansion, Radius of curvature, Tracing of some standard curves, Indefinite Integrals, Reduction formulae, Applications of definite integral to Area, Arc length, Surface area and volume (in cartesian, parametric and polar co-ordinates).

**Calculus of several variables:** Partial differentiation, Euler's theorem, Total differential, Taylor's theorem, Maxima-Minima, Lagrange's method of multipliers, Application in estimation of error and approximation.

**Multiple Integrals:** Double integral (Cartesian and polar co-ordinates), Change of order of integration, Jacobian, triple integrals (Cartesian, cylindrical and spherical co-ordinates), improper integrals, Beta and Gamma functions, differentiation under the integral sign, Applications of multiple integration in area and volume.

**Vector Calculus:** Continuity and differentiability of vector functions, Scalar and Vector point function, Gradient, Directional Derivative, Divergence, Curl and their applications, Line integral, Surface integral and Volume integral, Green's, Stokes' and Divergence theorems, Curvilinear coordinates.

**Linear Algebra:** Systems of linear equations and their solutions; vector space  $R^n$  and its subspace; spanning set and linear independence; matrices; inverse and determinant; range space and rank, null space and nullity, vector spaces, linear transformations. Matrices, Rank of a matrix, Inverse of a matrix using elementary transformations, Consistency of linear system of equations, Eigen-values and Eigenvectors of a matrix, Cayley Hamilton theorem, Diagonalization of a matrix, Similarity; Inner product, Gram-Schmidt process, Solutions of Coupled Linear Ordinary Differential Equations, Quadratic Forms

**Linear Ordinary Differential Equations:** First order - Separable Equations. Initial Value Problem, Integrating Factor. Linear Equations, Variation of Parameters. Second order-Homogeneous Equations with Constant Coefficients. Solution of Non-homogeneous Equations by D Operator Method. Particular Integral. Methods of Undetermined Coefficients and Variation of Parameters. Equations Reducible to those with Constant Coefficients. Euler Equations, Simultaneous linear equations, Applications to simple harmonic motion.

**Second Order Differential Equations and Special Functions:** Series Solution of Linear Second Order Ordinary Differential Equations : Singular Points of Second Order Differential Equations, Series Methods (Frobenius). Legendre, Bessel, Differential Equations. Legendre Polynomials : Rodrigues' Formulae, Generating Functions, Recurrence Relations, Orthogonality. Series Expansion of a Function in terms of a Complete set of Legendre Functions, Bessel Functions of the First Kind, zeros of Bessel Functions and Orthogonality

#### 4. CIVIL ENGINEERING:

**Engineering Mechanics & Strength Of Materials:** Vector concepts, rest and motion, Introduction to force systems (Parallel, Concurrent & Coplanar); Free Body Diagram; Equilibrium principle; Static analysis of systems; Friction and impending motion; rolling and sliding of cylinders; Newton's law of motion and derived concepts. Centroid; Area & mass moment of inertia. Work-Energy principle; Impulse; Collision of two bodies; Plane motion of particles and applications; Static analysis of simple structures; Method of joints and method of sections. Virtual work; combined motion of rotation and translation; Transmission of power by belt and gear drives. Stress & strain; Shear stresses, Principal stress and strain, Mohr's circle for stress and strain analysis, Beams & columns; Shear force and bending moment diagram. Theories of Failures; Columns, Struts; Stress & strain analysis of shafts under torsion, analysis of springs.

**Water Resources Engineering:** Hydrology: rainfall, stream flow measurements, runoff, hydrographs, flood studies, reservoir and channel routing, flood forecasting, flood protection measures, river training works, well hydraulics; Irrigation: Command area, duty and delta, canal outlets, crop-water requirement.

**Fluid Mechanics:** Properties of Fluid, Manometry, Forces on Plane and Curved surfaces, Flow classification, Continuity Equation, Momentum Equation, and Energy Equation and their Applications, Orifices, Venturimeter, Weirs and Notches, Laminar and Turbulent Flow through Pipes, Darcy Weisbach Equation, Moody Diagram, Steady Uniform Flow in Open Channels, Manning's Formula.

**Geotechnical Engineering:** Preliminary definitions & relationship, Determination of index properties, classification of soils, soil structure and clay mineralogy, permeability, Darcy's law, seepage analysis, compaction, one dimensional consolidation, Terzaghi's theory, shear strength, theoretical consideration and tests, shallow and deep foundations, soil exploration.

**Highway and Railway Engineering:** Highway Geometric Design: Cross sectional elements, Sight distances, horizontal and vertical alignments; Types and components of Pavement structures, Design of Flexible Pavements; Traffic Characteristics: Road user and vehicular characteristics, traffic volume studies, O-D studies and traffic capacity studies; **Railways:** Components, construction and maintenance of rail tracks, points and crossings.

**Surveying:** Contouring, Theodolite and its adjustment, measurement of angles and setting out

lines, Trigonometrical leveling, Tacheometry, Curves and different methods of setting out curves, Introduction to electronic Theodolites and Total Stations.

**Structural Design:** Working stress methods of design, singly and doubly reinforced sections, rectangular and Tee beams, shear, torsion and development length, one and two way slabs, short and long column, Design of isolated footings, Introduction of limit state design, Design for flexure, shear and compression, Design of riveted and welded connections, tension and compression members, splicing and lacing, Beam column connection, roof trusses.

**Environmental Engineering:** Estimation of quantity of water, per capita demand, population forecasting, water quality parameters, treatment of water, distribution system, Estimation of quantity of sewage, dry weather flow and storm run off, sewer appurtenances, characteristics of sewage, treatment and disposal of sewage, sludge digestion.

## 5. COMPUTER SCIENCE AND ENGINEERING:

### Operating System & System Software:

Overview of Operating Systems, Operating Systems Structures, Uses, Types and Functions of Operating Systems. File Systems, File System Implementation. Concept of Process-Process Management, Process Synchronization and Deadlocks, Inter-process Communications, CPU Scheduling. Memory Management – Allocation Schemes, Paging Segmentation, Virtual Memory, Demand Paging, Paging Replacement Algorithms. Disk Management – Disk Scheduling Algorithms.

System Softwares- Functions and Uses of System Software, Assemblers, Loaders, Linkers, Pass Structure of an Assembler, Loading Schemes, Macro and Co-Routines, Macro Processing and Macro Calls, Sub-Routines and Sub-Routine Calls.

**Digital Electronics & Elements of Logic Design:** Various Number Systems and their Implementation, Binary Arithmetic, 1's Complement, 2's Complement, 9's Complements & 10's Complements of a number. Floating Point Numbers, Boolean Algebra and Logic Functions. Different

Methods of Minimizing Boolean Functions. Design of Combinatorial Circuits – Adders, Multiplexer, Demultiplexer, Decoder, Parity Generator and Checker, Comparator Etc. Switching Algebra, Function Decomposition, Symmetric Function, Contact Networks, Design of Sequential Circuits (Synchronous



& Asynchronous) Flip-Flops, Register, Counter Fault Tolerant, Hazard, Stuck-At-Fault, Bridging Fault, Stuck-Open-Fault.

**Computer Architecture & Organization:** 8085 Microprocessor Architecture, Instruction Set, Assembly Language Program, Counters and Delays, Interrupts, Interfacing Data Converters, Programmable Interface Devices: 8155 Multipurpose Programmable Device, 8279 Keyboard/Display Interface, 8254 Interval Timer, 8259 Interrupt Controller, 8237 DMA Controller. CPU Structure and Function, Basic Idea of Hardware and Software, Instruction Sets: Characteristics, Functions and Formats, Addressing Modes; Computer Arithmetic, Control Unit: Microprogram Control, Hardwired Control; Memory: Internal Memory Organization, External Memory (Magnetic Disk, RAID, Optical Memory, Magnetic Disk), Cache Memory and Mapping Procedures; I/O Organization: Interrupts, Programmed I/O, Interrupt-Driven I/O, DMA, I/O Channels, Standard I/O Interfaces; RISC and CISC Processor, Basics of Parallel Processing, Pipelining.

**Programming Language Concepts and Data Structures:** Programming in C And C++, Syntax, Pre processor Directives, Built-In Data Types, User-Defined Data Types, Operators and Precedence, Loops and Conditional Flow of Control, Enumerated Types, Arrays, Variable Types and Scope of Variables, Global, File and Namespace, Functions, Pass By Value, Pass By Reference, Input and Output Handling. Arrays, Link Lists, Stacks, Queues, Trees, Graphs: Representations, Implementations and their Applications – Arithmetic Expression Evaluation, Recursion, Priority Queues, Etc., Graph and Tree Traversals, Basic Search Techniques: Tree Searching: Binary Search Trees, Avl Trees, Etc., Hashing Techniques.

Basic Sorting Techniques: Bubble Sort, Insert Sort, Selection Sort, Radix Sort, Tree Indexes : M-Way Search Trees, B-Trees, B+ Trees.

## 6. MECHANICAL ENGINEERING:

**Engineering Mechanics & Strength Of Materials:** Vector concepts, rest and motion, Introduction to force systems (Parallel, Concurrent & Coplanar); Free Body Diagram; Equilibrium principle; Static analysis of systems; Friction and impending motion; rolling and sliding of cylinders; Newton's law of motion and derived concepts. Centroid; Area & mass moment of inertia. Work-Energy principle; Impulse; Collision of two bodies; Plane motion of particles and applications; Static analysis of simple structures; Method of joints and method of sections. Virtual work; combined motion of rotation and translation; Transmission of power by belt and gear drives. Stress & strain; Shear stresses, Principal stress and strain, Mohr's circle for stress and strain analysis, Beams & columns; Shear force and bending moment diagram. Theories of Failures; Columns, Struts; Stress & strain analysis of shafts under torsion, analysis of springs.

**Engineering Materials:** Mechanical, thermal, chemical properties, structure of materials, alloys. Iron and its alloys, Iron carbon phase diagrams, steel and their important alloys of iron, heat treatment processes, Elastic & plastic behaviors; Plastic deformation. Effect of various alloying elements on mechanical properties of Iron: Bearing alloys; Powder metallurgy; Fick's law. Commonly used engineering materials for tools, engineering components and household objects.

**Design of Machine Element:** Concept of FOS, material selection, engineering materials, Design of Rivets, Screws, Bolts with detail analysis. Cotter and Knuckle joints, shafts, keys and couplings, Springs – helical and leaf types.

**Hydraulics and Hydraulic Machines:** Properties of liquid, hydraulic pressure and its measurement, Forces on immersed bodies; Center of pressure; Buoyancy stability of immersed and floating bodies; Flow of liquids: 1-D, 2-D, & 3-D flows; steady, unsteady, laminar and turbulent flows; continuity equation, momentum equation, and energy equation and their applications, Euler equation and Bernoulli's equation; Orifice, mouth piece and nozzles, flow through pipes and piping systems, losses in piping systems; fundamentals of channel flow, hydraulic jump; flow measurements : Dimensional analysis and associated theorems. Non dimensional numbers and their significances; Stream function and velocity potential function; streamline, streakline and pathline; Rotational and irrotational flow, circulation and vorticity; Free and forced vortex; Basic flows like rectilinear, source, sink, doublet etc. Different types of pump, reciprocating and rotary pumps, operation and maintenances of pumps, Cavitation and NPSH; Characteristic curves of pumps, losses and efficiencies of pumps. Compressors, blowers and fans. Different types of turbines, Francis, Kaplan and Pelton turbines, operation and

maintenance of turbines; characteristic curves, work done and efficiency of turbine, specific speed and selection of pumps and turbines. Hydraulic machinery like hydraulic ram, hydraulic coupling and torque converter, hydraulic jack, screw pump, Gear pump, Vane pump etc.

**Thermal Engineering:** Basic thermodynamic concepts; System and surrounding; Thermodynamic Properties; Intensive and Extensive properties; Point and path functions; Zeroth law, first and second laws of thermodynamics and associated corollaries; Concepts of absolute temperature, internal energy, enthalpy & entropy; Clausius inequality, concept of availability, Maxwell's relations. Application of thermodynamic laws, reversibility & irreversibility, internal & external irreversibility; Pure substances and mixtures. Thermodynamic cycles: Carnot cycle, Rankine cycle, Joule-Brayton cycle; Air standard cycles; Otto cycle and Diesel cycles. Ideal gas compression and compressors, jet propulsion, gas compressors, steam generators, Fuel and combustion, I.C. engine, calculation of efficiencies, testing of IC. Engines; Open and closed gas turbine cycles, introduction to heat and mass transfer; heat exchanger; LMTD and NTU methods. 65 Principles of refrigeration, air refrigeration system, Vapor compression refrigeration system, refrigeration cycles, use of T-S & P-H charts for refrigeration, refrigerants and their properties, vapor absorption system, psychometric properties and charts. Types of power plants; components of steam power plant; hydro-electric power plant, nuclear power plants, diesel power plant. Elementary solar and geothermal power systems.

**Theory of Machines:** Kinematics and kinetics; mechanisms and structure; inversions; kinematic chains; different types of mechanisms; degree of freedom & its determination; Grashof's criteria; velocity analysis; acceleration analysis; gear trains; balancing of rotating masses; brakes & dynamometer.

**Production and Industrial Engineering:** Fundamentals of metal cutting, tool geometry, Calculations of cutting forces and tool life; General purpose machine tool and their operations, various welding techniques like arc, gas, resistance etc. Metal forming methods like rolling, drawing, extrusion, press working; powder metallurgy; heat treatment of metals; Introduction to NC and CNC machines; basics of measuring instruments; study of transducers; static and dynamic characteristic of instruments; Introduction to metrology: Limits, fits and tolerance, Mechanical and optical comparators; Measuring instruments of angles; measurements of surface roughness and thread profiles, calibration of various measuring instruments. Production planning; Inventory control; material and wage calculation; elements of cost; network analysis;

work study and estimating machining time; break even analysis; TQM & ISO 9000; Shop floor management; Machines & Industrial safety.

## 7. ELECTRICAL ENGINEERING:

**Electrical Circuits:** Phasors and phasor algebra, balanced and unbalanced poly-phase circuit, Test signals, Star-Delta transformation, Network theorems, Parameters of electromagnetic circuits, resonance in R-L-C Series and Parallel circuits, Network analysis by mesh and node methods.

**Electrical Engineering Materials:** Conducting, Insulating materials and Magnetic materials, Properties and applications.

**Electrical Instruments and Measurements:** Principles of measurements: Classification, accuracy and sensitivity, damping and control forces, shunt and multiplier, Measurement of resistance: Low, medium and high. Principle and uses of DC potentiometers, AC Bridges. Indicating instruments: Multimeter, PF meters, synchroscope.

**Electrical Machines:** Classification of D.C. machines: Constructional features, e.m.f., torque, excitations, motor performance, speed, power, size considerations, speed control, efficiency.

**Transformers:** Induced e.m.f., equivalent circuits, regulation, different efficiencies. Three phase induction machines: Torque characteristics, Starting, equivalent Circuits. Three Phase Synchronous Machines: Generation, voltage regulation, parallel operation, synchronous motor, starting and V-curves, Single phase motors: type, starting characteristics.

**Generation, Transmission and Distribution:** **Generation-** Thermal, Hydel and Nuclear Power Stations, Prime movers and alternators. **Transmission-** Voltage levels, line conductors, electrical line parameters of short and medium lines, voltage regulation, corona. **Distribution-** D.C. and A.C. systems, voltage level, types of distribution feeders and distributors, voltage drop and effects, power factor improvement plant. **Substation-** Different types, site selection, equipments, electrical earthing. Switchgear: Switches, isolators, circuit breakers and their types. Protection: Fault current and protective devices, fuses, relay functions, alternator, Transformer protection, thermal relays, over voltage-causes, effect and protective devices.

**Power Electronics:** Power diodes and Darlington Pair. Thyristor: Principle, thyristor family, firing circuits, applications, Selenium rectifiers, uncontrolled and controlled rectification, Power MOSFETS.

**Digital Electronics:** Digital signals, gates, Boolean algebra, logic families, multiplexures / demultiplexure, Encoders/decoders, flip-flops, registers, counters and applications of logic gates, OPAMPS in timing circuits, A/D and D/A conversion.

## 8. ELECTRONICS AND COMMUNICATION ENGINEERING:

**Electronic Devices and Circuits: Analog Devices and circuits-**Physics of Semiconductor Materials & Components, Energy band diagram, Fermilevel, Hall effects. **Devices-**Diodes, BJT,s FET,s, Thristors, Tunnel diodes, Basics of IC,s and operational amplifiers.

**Circuits-** Biasing circuits of transistors, Design of power supplies using Diodes and transistors-voltage Regulator Circuits Transistor Amplifier (BJT & FET), Power amplifiers, feedback amplifiers, oscillators (qualitative analysis only). Multivibrators, Time base circuits. Regulated Power supply. Time base circuit Saw-tooth voltage and current generators, transistor switches, wave shaping circuit (diode and transistors) Electro-static and magnetic deflection methods, low frequency h-parameter transistor & FET models, Pi models.

**Digital Devices and Circuits: Number systems-**logic gates-Boolean Algebra-Transistor as a switchlogic families-Arithmetic and logic circuits-Counters and shift registers-A/D and D/A converters, Multiplexer, Demultiplexer, Encoder, Decoder.

**Electronic Instrumentation and Measurements:** Systems, units and standards of Measurement, AC and DC indicating instruments, AC and DC bridge circuits, Error Analysis of generalized measurement systems, transducers (Strain gauge, LVDT. Thermistor, Thermocouple etc.) Electronic Measuring Instruments, CRO, Digital Ammeter, Millimeter, Voltmeter, Time and Frequency measurements, Signal Generators, Q-meter, Wattmeter, Energy meter.

**Communication Engineering:** Introduction to signal analysis-Fourier series and Fourier transform. Sampling theorem, Parseval's theorem, convolution, Transmission through linear systems: AM,FM PM, Pulse modulation; PCM: Amplitude limiting in FM, Pre-emphasis, De-emphasis; Noise in AM and FM: Multiplexing-FDM, TDM; ASK, FSK, Block schematic of

different transmitters for AM, FM,SSB, ISB systems; Superheterodyne receivers, Mixers, AGC, AFC, spectrum of EM waves; Propagation of EM waves-sky waves- sky wave, ground wave, space wave, skip distance, maximum usable frequency; Antenna fundamentals and Radiation; Communication systems;; Principles of telegraphy, telephony and television broadcasting , Basics of satellite and optical fibre communications: Fundamentals of telematics.

## Short-listing

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The list of shortlisted candidates selected for admission on the **basis of merit list** of the Entrance Test shall be displayed in the notice board and also uploaded in the University website. Only those candidates who have scored a minimum of 45% marks in the Entrance Test (40% marks in case of SC/ST/PWD) will be eligible for admission through Lateral Entry. Two separate Merit Lists shall be prepared –one for candidates possessing Diploma in Engineering and the other for the candidates possessing B. Sc. Degree. Preference shall be given to the Diploma holders in Engineering in filling up the available seats first. The students belonging to B.Sc. Stream shall be considered only after exhausting the eligible students of Diploma stream.

## Admission

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The tentative schedule of Course Registration and Admission is given in **Annexure I**. Selected candidates should get admitted to the concerned programme by paying all fees as per schedule. The candidate's presence at the time of verification of testimonials etc., course registration and hostel admission is essential. The fee structure is given in **Annexure-II**. The selected candidates will have to produce all relevant documents in original at the time of admission.

### Refund of Caution Deposit

Refund of caution money shall be made to a student after his/her release from the University. The claim for refund of caution money shall not be entertained beyond a period of one year from the date of release of the student. The caution money shall not be refunded if a student leaves the programme without permission and/or does not join and attend any class after

admission. Refund of caution money shall be made against application in prescribed form and production of Release Order.

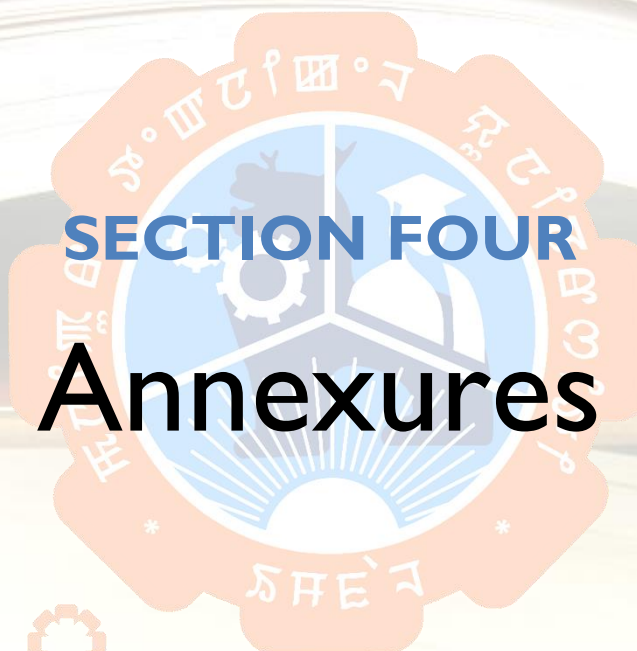

## How to Apply

Eligible candidates can apply by submitting the duly filled application form to the office of the **Registrar Manipur Technical University, 2<sup>nd</sup> Floor, Secured Office Building, North AOC, Imphal** on or before the last date on payment of application fee of Rs. 500/- (for Gen/OBC) and Rs. 300/- (for SC/ST) respectively either in cash or Demand Draft drawn in favour of “Manipur Technical University” payable at Imphal.

The application form may be downloaded from the website [www.mtu.ac.in](http://www.mtu.ac.in) or [www.mtuonline.in](http://www.mtuonline.in)

### Documents to be submitted along with the application form

1. Self-attested photocopy of Certificate of High School Leaving Certificate (HSLC) Examination or equivalent Class 10<sup>th</sup> Examination (As proof of Date of Birth).
2. Self-attested photocopy of Mark Sheet of High School Leaving Certificate (HSLC) Examination or equivalent Class 10<sup>th</sup> Examination.
3. Self-attested photocopy of Mark Sheet of Diploma of Engineering/B. Sc.(Candidates who are awaiting declaration of the results may submit it when the results are declared)
4. Details of Fees Paid.
5. SC/ST/OBC/Person with Disability (PWD) Certificate (if applicable). A copy of such Certificate is mandatory in case the applicant/candidate wants to claim seat under the respective reserved category.



**SECTION FOUR**  
**Annexures**



MANIPUR TECHNICAL UNIVERSITY





## ANNEXURE – I

### Important Dates

Sl.	Event (s)	Date (s)
1	Issue and receipt of Application Forms	6 <sup>th</sup> June, 2017 to 27 <sup>th</sup> June, 2017 <b>(21 days)</b>
2	Issue of Admit Card for Entrance Test	25 <sup>th</sup> June, 2017 to 1 <sup>st</sup> July, 2017 <b>(07 days)</b>
6	Entrance Test for admission to B. Tech.-3 <sup>rd</sup> semester through Lateral Entry	2 <sup>nd</sup> July, 2017 (Sunday)
7	Publication of the result of the Entrance Test	4 <sup>th</sup> July, 2017
8	Admission of selected students through Entrance Test	5 <sup>th</sup> July, 2017 to 14 <sup>th</sup> July, 2017 <b>(10 days)</b>
9	Commencement of classes for 3 <sup>rd</sup> semester	15 <sup>th</sup> July, 2017

## ANNEXURE – II

### Fee Structure for Admission

#### Academic Fees:

SL. NO.	ITEMS	1 <sup>ST</sup> SEM FEE (₹)	2 <sup>ND</sup> SEM FEE (₹)	3 <sup>RD</sup> SEM FEE (₹)	4 <sup>TH</sup> SEM FEE (₹)
1	Admission fee (one - time)	1000	-	-	-
2	Tuition Fee *	16000	16000	16000	16000
3	Institution Development fee	6000	6000	6000	6000
4	Students activity fee	1000	1000	1000	1000
5	Medical facility fee	1200	-	1200	-
6	Caution Money (Refundable)	5000	-	(5000 for the Lateral Entrants)	-
7	ID fee	300	-	-	-
8	Library and Laboratory Fee	1000	-	1500	-
9	Degree Certificate Fee	-	-	-	-
	<b>Total</b>	<b>31500</b>	<b>23000</b>	<b>25700</b>	<b>23000</b>

***NB:** A student seeking admission to B. Tech. (3<sup>rd</sup> semester) through Lateral Entry should pay a caution money of Rs. 5000/ only along with the fees meant for 3<sup>rd</sup> semester i.e. total fees payable by him/her is Rs. 30,700/ only for the semester. A concession of 1/3<sup>rd</sup> of Tuition Fee is given for ST/SC/PWD students.*

Residence Fees:

SL. NO.	ITEMS	1 <sup>ST</sup> SEM FEE (₹)	2 <sup>ND</sup> SEM FEE (₹)	3 <sup>RD</sup> SEM FEE (₹)	4 <sup>TH</sup> SEM FEE (₹)
1	Residence Admission fee (one time)	1000	-	-	-
2	Hostel rent	2500	2500	2500	2500
3	Electricity and water charge	1500	1500	1500	1500
4	Hostel caution money (Refundable)	5000	-	(5000 for Lateral Entrants)	-
5	Mess charge	13000	13000	13000	13000
	<b>Total</b>	<b>23000</b>	<b>17000</b>	<b>17000</b>	<b>17000</b>

*NB: A student admitted through Lateral Entry and seeking Hostel admission should pay a Hostel caution money of Rs. 5000/ only along with the residence fees meant for 3rd semester i.e. total fees payable by him/her is Rs. 22,000/ only for the semester.*