Tribhuvan University
Institute of Engineering
**Entrance Examination Board**

# Information Brochure

**Entrance Examination and Admission Procedure for M.Sc. Programs under IOE**

## IOE Entrance Examination Board-2073

2017(2073)

*First Amendment on 2073-11-08 (19th Feb 2017)*

Tribhuvan University
Institute of Engineering
**Entrance Examination Board**

Detailed Schedule for Entrance Examination of Masters Programs – 2073

Time and Date for Online Application:

From 10 AM, 1st Falgun 2073 (12th February 2017)
To 5 PM, 15th Falgun 2073 (26th February 2017)

Admit card can be downloaded during Falgun17-18, 2073 from the website:
**http://entrance.ioe.edu.np OR www.ioe.edu.np/entrance**

Entrance Examination will be held at ICTC, IOE, Pulchowk:
20-21 Falgun 2073 (March 3-4, 2017)

Publication of Result: By 25th of Falgun, 2073 (By 8th March, 2017)

**To be eligible for master's entrance application, the candidate must have passed bachelor degree in relevant subjects with at least second division.**

**Admission Notice for the successful candidates shall be published by the Admission Committee of Constituent Campuses of IOE. The Academic session starts from 17th Baisakh 2074 (30th April, 2017)**

**Those applicants who will be eligible for admission of IOE master's program of the year 2017/2018 from this entrance examination will also be eligible to apply for Masters Scholarships of the year 2017/2018 as per Scholarship Bylaws to be announced by Ministry of Education (MoE), Government of Nepal.**

त्रि.वि. इन्जिनियरिङ्ग अध्ययन संस्थानद्वारा शैक्षिक बर्ष २०७३/०७४ मा संचालन गरिने स्नातकोत्तर तहको प्रबेश परीक्षा उतीर्ण गर्ने परीक्षार्थीहरु नेपाल सरकार, शिक्षा मन्त्रालयको छात्रबृत्ति सम्बन्धी नियमावली अनुसार तोकिएको कानुनी मापदण्ड पुरा गरेमा सो मन्त्रालयद्वारा २०७३/०७४ मा प्रदान गरिने स्नातकोत्तर तहका उच्च शिक्षाका छात्रबृत्तिहरुका लागि समेत उम्मेदवार हुन योग्य हुनेछन् ।

# INTRODUCTION

## 1.1 History of IOE

History of engineering education in Nepal can be traced to 1942 AD, when Technical Training School was established. Engineering section of the school offered only trades and civil sub-overseers programs. In 1959, Nepal Engineering Institute, with the assistance of the government of India, started offering civil overseer courses leading to Diploma in Civil Engineering. The Technical Training Institute established in 1965, with the assistance from the Government of Federal Republic of Germany, offered technician courses in General Mechanics, Auto Mechanics, Electrical Engineering and Mechanical Drafting.

In 1972, the Nepal Engineering Institute at Pulchowk and the Technical Training Institute at Thapathali were brought together under the umbrella of the Tribhuvan University (TU) to constitute the Institute of Engineering (IOE). Nepal Engineering Institute and the Technical Training Institute were renamed as Pulchowk Campus and Thapathali Campus respectively.

Since then, IOE has expanded considerably. The technician programs in Electrical, Electronics, Refrigeration/Air-conditioning Engineering were started in the Pulchowk Campus, with the assistance from UNDP/ILO in 1972. The Architecture Technician program was started by the IOE in its own effort in 1973. As first Bachelor's Degree level course in Engineering in Nepal, B. E. Civil Engineering was started in 1984 in its own effort. In 1994, with the assistance of the World Bank, the Swiss Government, and the Canadian Government, Bachelor Degree level courses in Engineering were extended to Electronics & Communication and Electrical engineering. In 1995, Mechanical engineering and Architecture were started in the Pulchowk Campus. From the academic year 1998/99 Bachelor's Degree program in Computer Engineering, from 2001, Bachelor's Program in Agriculture Engineering was started at Purwanchal Campus. In 2006, Bachelor's Program in Industrial Engineering, and in 2015, Bachelor's Program in Automobile Engineering was started at Thapathali Campus.

From the year 2014, all the diploma programs were phased out and the IOE concentrated its programs spanning from Bachelor through Master to Ph.D. levels.

## 1.2 Initiation of (Post Graduate) Master Programs in (IOE) Constituent Campuses

In 1996, Pulchowk Campus with support from the Norwegian Government, has started M.Sc. Courses in Urban Planning, Structural Engineering, Environmental Engineering and Water Resources Engineering. Pulchowk Campus has also started M.Sc. courses in Renewable Energy Engineering, Geotechnical Engineering, Information and Communication and Power System Engineering effective from December, 2001. Pulchowk Campus, with support from the Norwegian Government, has started M.Sc. Courses in Sustainable Water Sanitation and Health Development from 2007, Technology and Innovation Management from 2010. This campus has also started master program in Transportation Engineering and Disaster Risk Management from

the academic year 2011/12. A category-wise detail of intake capacity of Master Program is given in section 1.5 of this document. Institute has also started regular Ph D admission from academic session 2010/11 in all departments. A new Master's program in Earthquake Engineering was started at Thapathli Campus under IOE in 2071 BS.

In 2072 BS (2016 AD), an additional master program –'Energy for Sustainable Social Development'- has been started at Central Campus Pulchowk. Similarly, new master programs in Electrical Engineering in Distributed Generation, Civil Engineering in Infrastructure Engineering and Management, and Master program in Computer Engineering, have started at Paschimanchal Campus Pokhara, under IOE from the academic year 2072 BS (2014AD).

### 1.3 Online Application

The candidate willing to appear in the entrance examination to get enrollment into the M.Sc. program should fill and submit the Application Form online within the deadline prescribed by the Entrance Exam Board. Application forms will be available in the websites: **www.ioe.edu.np/entrance** or **http://entrance.ioe.edu.np**. The application procedures are as follows:

1. The candidate should deposit an amount of Rs 2,000 as an application fee for entrance examination in Account No. 00915056064 of the Siddhartha Bank Limited by submitting a specially prepared voucher often by filling applicant's name and date of birth in it. The voucher No. indicated in the voucher needs to be specified in the online application form.
2. The candidate must select the appropriate entrance stream.
3. The candidate should fill up the other required fields in the form without skipping any steps.
4. The candidate also needs to upload his/her color photograph of prescribed specification and one of the following identification documents.
    - Citizenship certificate
    - Passport
    - Last exam admit card

If any change has to be done on the submitted information in application form, candidate has to pay NRs 150 to edit six or less number of normal text fields. For name, photo or ID document correction, he/she has to pay NRs 200 at ICTC and submit a letter of request for correction with the payment voucher

### 1.4 Provision of Admit Cards

Admit card can be downloaded on 17$^{th}$of Falgun 2073 (28$^{th}$ February, 2017) onwards from the website: **http://entrance.ioe.edu.np.** Applicants should bring the admit card and the mentioned original identification document with hem/her during the entrance examination. Without original ID document and color printed admit card, applicant will not be allowed to appear in the entrance examination.

### 1.5 Intake Capacities

The quota distribution for all M.Sc. Programs on current intake capacities is listed in the Table-I while the programs and offering department of constituent campuses are depicted in Table-II.

**Table-I:** Seats/Quota Distribution for All M.Sc. Programs

| Masters Programs | Regular Merit | IOE Reserved | Full Fee | Sponsored | Total Intake |
|---|---|---|---|---|---|
| Each Master's program | 5 | 1 | 6 | 8 | 20 |

**Table-II:** M.Sc. Programs and Offering Departments

| Campus | Master Programs | Offered By |
|---|---|---|
| **Pulchowk Campus, Lalitpur** | Information & Communication Engineering | Department of Electronics and Computer Engineering |
| | Computer Systems and Knowledge Engineering | |
| | Power System Engineering | Department of Electrical Engineering |
| | Structural Engineering | Department of Civil Engineering |
| | Water Resources Engineering | |
| | Geotechnical Engineering | |
| | Transportation Engineering | |
| | Disaster Risk Management | |
| | Environmental Engineering | |
| | Construction Management | |
| | Renewable Energy Engineering | Department of Mechanical Engineering |
| | Energy Systems Planning and Management | |
| | Technology and Innovation Management | |
| | Mechanical Systems Design and Engineering (proposed) | |
| | Material Science & Engineering | Department of Science and Humanities |
| | Climate Change and Development | |
| | Energy for Sustainable Social Development | Department of Architecture |
| | Urban Planning | |
| | Energy Efficient Buildings (Proposed) | |

| Campus | Master Programs | Offered By |
|---|---|---|
| **Thapathali Campus, Kathmandu** | Earthquake Engineering | Department of Civil Engineering |
| | Mechanical Engineering Design and Manufacturing (proposed) | Department of Mechanical & Automobile Engineering |
| **Paschimnchal Campus, Pokhara** | Communications and Knowledge Engineering | Department of Electronics and Computer Engineering |
| | Distributed Generation Engineering | Department of Electrical Engineering |
| | Infrastructure Engineering and Management | Department of Civil Engineering |

1. One seat in regular category and One seat in full fee category are reserved for female candidates in each program
2. One seat is reserved for IOE faculty. For IOE Reserved Quota, priority will be given to permanent IOE faculty. If there are no applicants from permanent IOE faculty, then priority will be given to faculties who have completed 5 years as a contract faculty. If there is no applicant in IOE reserve quota, it is added to Full Fee Seat. 1/4$^{th}$ of the sponsored quota is reserved for the Foreign students.
3. Priority for the sponsored quota will be as follows:
   1$^{st}$ Priority: Candidates from government offices & Government Owned Organizations or Companies
   2$^{nd}$ Priority: Other Organizations
4. If applications are not received in sponsored/foreign category, then the seat will be fulfilled as full fee category.

### 1.5.1 Provision for the Foreign Students

1/4$^{th}$ of sponsored quota on each program has been reserved for foreign students interested to earn master's degree under IOE. They are eligible only for sponsored (self-sponsored) category and should be admitted as foreign students.

Following are the requirements for foreign students to study at IOE.

1. Students with foreign citizenship are recognized as foreign students and should have passed bachelor degree in engineering with average grade point of at least 'B' or equivalent. (*see section 2 for entry requirements of relevant streams in bachelor to be enrolled into corresponding master's degree program*)
2. Foreign citizens who completed bachelor or equivalent degree from universities within Nepal should appear in the entrance examination by the normal entrance procedure.

3. One recommendation letter from the past University subject instructor/supervisor or mentor if his/her bachelor degree is form foreign university.
4. Transcripts and Degree Certificates of Bachelor of Engineering Degree.
5. One page motivation letter not exceeding 500 words mentioning candidate's interest to study masters at IOE, TU, Nepal.
6. If the bachelor or equivalent degree is from the foreign university, the degree should be accredited by the concerned body of TU before proceeding to admission.

To enroll for the academic year 2017-2019, applicant should submit his/her necessary documents (application form, bachelor transcripts and degree certificates, recommendation letter, motivation letter (Statement of Purpose), scanned copy of 1st page of the passport) via email at admission@ioe.edu.np on or before 26th February, 2017. Candidate will be informed for interview via telephone or online video conferencing.

## 2. ENTRY REQUIREMENT AND ADMISSION PROCEDURE

### 2.1 Eligibility Criteria

To be eligible for the admission to the Master Program, a candidate must fulfill the program entry requirements listed in Table-III.

**Table-III:** Pre-Requisite Degree Requirements for M.Sc. Programs

| SN | Programs | Entrance Streams | Pre-Requisite Degree |
|---|---|---|---|
| 1. | Urban Planning | PA/CA | B.Arch./B.E (Civil) M.A.(Geography) or Eq. |
| 2. | Information & Communication Engineering | EC/EE | B.E (Electronics/Electrical/Computer) or Equivalent |
| 3. | Structural Engineering | CA | B.E (Civil) or equivalent |
| 4. | Power System Engineering | EE | B.E (Electrical) or equivalent |
| 5. | Renewable Energy Engineering | EE/CA/MI | B.E (Electrical, Civil/Agriculture, Mechanical/Industrial/Auto-Mobile) or Equiv. |
| 6. | Water Resources Engineering | CA | B.E (Civil or Agriculture) or equivalent |
| 7. | Geo-Technical Engineering | CA | B.E (Civil or Agriculture) or equivalent. |
| 8. | Transportation Engineering | CA | B.E (Civil or Agriculture) or Equivalent |
| 9. | Technology and Innovation Management | ALL except AS | B.E. or Equivalent |
| 10. | Disaster Risk Management | ALL | B.E in any field/B.Arch./M.Sc. Science |
| 11. | Energy Systems Planning and Management | EE/CA/MI | B.E (Electrical, Civil/Agriculture, Mechanical/Industrial/Auto-Mobile) or Equiv. |

| SN | Programs | Entrance Code | Pre-Requisite Degree |
|---|---|---|---|
| 12. | Computer System and Knowledge Engineering | EC | B.E (Electronics, Computer) or Equivalent |
| 13. | Environmental Engineering | CA | B.E (Civil or Agriculture) or equivalent |
| 14. | Construction Management | CA/PA | B.E (Civil or Agriculture), B.Arch. or equiv. |
| 15. | Climate Change and Development | ALL | B.E/B.Sc. Agriculture/ B.Sc. Forestry/ B.Sc. Science(4 years), B.Arch. or equivalent |
| 16. | Material Science & Engineering | ALL | B.E/ B.Sc. Agriculture/ M.Sc. Science for 3 years bachelor degree/B.Sc. Science(4 years) B.Arch. or equivalent |
| 17. | Energy for Sustainable Social Development | PA/CA/MI | B.Arch./B.E in Civil, Mechanical, Industrial and Agriculture Engineering or equivalent |
| 18. | Earthquake Engineering | CA | B.E (Civil) or equivalent |
| 19. | Infrastructure Planning and Development | CA | B.E (Civil) or equivalent |
| 20. | Communications and Knowledge Engineering | EC | B.E (Electronics & Communication, Electrical & Electronics, Computer) or Equivalent |
| 21. | Distributed Generation Engineering | EE | B.E Electrical or Equivalent |
| 22. | Mechanical Engineering Design and Manufacturing (Proposed) | MI | B.E Mechanical/Industrial or Equivalent |
| 23. | Mechanical Systems Design and Engineering (Proposed) | MI | B.E Mechanical/Industrial or Equivalent |
| 24. | Energy Efficient Buildings (Proposed) | PA/CA | B.E. Civil, B.Arch or Equiv. |

- Have undergraduate grades significantly above average and not less than prescribed ones by the faculty board of IOE, and Secure minimum score, as prescribed by the Faculty Board of IOE, in the entrance test conducted by the Entrance Exam Board of IOE.

**Note**: Equivalence means the same kind of degree obtained from institutes other than TU and recognized by TU as the equivalent to the degree provided by TU in the same discipline.

### 2.2 Mode of Entrance Examination

The candidate should appear in one of the streams (listed in Table-IV) of entrance examination to get the admission in any Master Program at IOE.

**Table-IV:** Entrance Streams and Code

| S. No. | Entrance Streams | Entrance Code |
|---|---|---|
| 1 | Planning and Architecture | PA |
| 2 | Civil & Agriculture Engineering | CA |
| 3 | Electrical Engineering | EE |
| 4 | Electronics & Computer Engineering | EC |
| 5 | Mechanical and Industrial Engineering | MI |
| 6 | Applied Science | AS |

- Entrance examination will be of Computer Based Multiple Choice Type – of 2 hours duration consisting of two sections. **Section- A** is common to all streams, consisting of 45 questions of 50 marks. While **Section-B** consists of stream specialized course with 50 nos. of questions of 1 mark each.
- The Candidates have to secure minimum marks as prescribed by the Faculty Board of IOE.
- All questions will be in English.
- There will be 10% negative marking for wrong answer.
- Non programmable calculators are permitted. Exchange of calculators is strictly prohibited. Candidates have to bring their own calculators in the exam hall.

### 2.3 Selection Process

The Entrance Examination Board of IOE will publish the list of the successful candidates in the entrance examination notice board and via the website whereas the Admission Committee of Constituent campuses will take care of admission procedure.

- Candidate who passed the relevant bachelor degree and fulfilling the program entry requirements will be selected for the admission on the basis of merit list based on the score of the Entrance examination.
- T.U. recognized AMIE candidates selected on the basis of merit list based on the score of entrance examination shall, however, be offered provisional admission for the following academic years. Such candidates after passing the prerequisite courses specified by IOE will have to join the respective program within two academic years.
- Admission committees of respective Campuses will publish the list of admission as per its schedule. The candidates should contact the Campus Admission Committee. All the selected candidates should follow the schedule published by the committee. Vacant seats due to the failure of any candidate to enroll in the prescribed time will be filled by admitting candidates from the consequent next list.

### 2.4 Admission

- The successful candidate should pay required fee and complete the procedures within the time prescribed by the Admission Committee of the Campuses. Candidates failing to do so

will lose the opportunity to get the admission. The following documents should be presented at the time of admission:

- Original and attested copies of transcripts of all academic records from SLC onwards to the latest approved degree (bachelor/masters).
- Original copies of migration and provisional certificates, if applicable.
- Original copy of Nepali citizenship certificate, passport for foreign students
- Certificate of completion of prerequisite courses with pass marks for TU recognized AMIE candidates.

- In case of discrepancy on verification of the original certificates, or in case of inclusion of the candidate's name in the admission list by mistake of any kind, admission of such a candidate will be cancelled even after his /her formal admission.
- To be eligible for master's entrance application, the candidate must have passed bachelor degree in relevant subjects with at least second division.

**Note:**

In any program, if 60% of the full fee and sponsored seats are not fulfilled within admission deadline, that program may be suspended for that academic year and the amount paid by the candidate in the admission process shall be refunded.

### 2.5 Fee Structure

Fees arrangements for Masters' Program are listed in Table-V below.

**Table-V:** Fee Distributions for M.Sc. Programs

| Descriptions | Regular | Full Fee | Sponsored | Foreign Student |
|---|---|---|---|---|
| Tuition fee (Per Semester) | 12,180/- | 37,680/- | 1,35,000/- | US $ 1,800/- |
| Exam Fee (Per Semester) | 1,000/- | 1,000/- | 1,000/- | US $ 10/- |
| Refundable Deposit | | | | |
| Campus Deposit | 1,000/- | 1,000/- | | US $ 10/- |
| Lab Deposit | 1,000/- | 1,000/- | | US $ 10/- |
| Library Deposit | 1,000/- | 1,000/- | | US $ 10/- |
| Nonrefundable Fund | | | | |
| Campus development Fund | 3,000/- | 3,000/- | | US $ 200/- |
| Maintenance Fund | 2,000/- | 2,000/- | | |
| ID Card Fee | 175/- | 175/- | 175/- | US $ 20/- |
| At the time of Admission | 21,355/- | 46,855/- | 5,42,175/- | US $2,060/- |
| TU Registration fee Rs 500/- (Rs 1000/- for the students passing B. E. or equivalent from abroad) | | | | |
| ***The candidates under sponsored category have to pay the fee for full course duration (two years) at the time of admission. Also payment of fees by the candidate under sponsored category shall be received only by cheque of the sponsoring agency. The cash transaction shall not be entertained.*** | | | | |

The candidates should pay extra charge for internet access and conference publication separately during admission as per Campus rule and any extra services as specified by TU. The given fee structure is for completing the minimum specified courses within two years of academic session. Candidates willing to secure extra credit courses or failing to complete the courses within the specified time frame should pay extra fee accordingly as per campus regulation.

In case, the admitted student needs to cancel his/her admission, following rules are applicable in reimbursement of fees:

a. 25% deduction from tuition fee of one semester prior to the start of class.
b. 50% deduction from tuition fee of one semester till $7^{th}$ day after the start of class.
c. No refund of tuition fees and nonrefundable deposits following the $7^{th}$ day from the commencement of the class.

### 2.6 Student Hostel

Hostel facilities are available for few selected students according to campus rules and regulations. The charges for the hostel shall be as per the decision of the campus administration.

## 3. CURRICULUM FOR M.Sc. ENTRANCE EXAMINATION

The M.Sc. Entrance examination for the academic year 2073/2074 (2017/2018AD) will be "Computer Based Examination" of two hours duration, consisting of two sections.
**Section- A** is common to all streams, consisting of 45 questions of 50 marks. While **Section-B** Consists of stream specialized course with 50 questions of 1 mark each. Each question will be of objective type with multiple choice answers and negative marking is 10%.

### SECTION-A

The depth of subject matter in this section shall be similar to Bachelor Level.

### 1. Critical Reasoning [5 × 2]

Critical reasoning sections aim to test the candidate's comprehension of the interpretative abilities in English as a language of business and communication. Critical reasoning questions measure your ability to read with understanding, insight and discrimination. These questions explore your ability to analyze a written passage from several perspectives, including your ability to recognize explicitly stated elements as well as underlying statements or arguments and their implications. This section measures reading comprehension and critical reasoning skills in a multiple-choice format.
The Critical reasoning section measures your ability to
• analyze and evaluate written material and synthesize information obtained from it.
• analyze relationships among component parts of sentences.

**2. Mathematics** **[40 × 1]**

The format of these multiple-choice questions varies. The solution may require simple Computations, manipulations or multi-step problem-solving.
These sections aim to test the candidate's understanding of
Basic Mathematics (Numbers: operations; Fractions, Decimals and Percentages; Ratio and Proportion; Roots and Power;
Logarithms; Progressions; Elementary Geometry and Mensuration; Elementary Trigonometry; Introductory Set Theory)
Algebra (Polynomials, Equations and Inequalities; Simultaneous equations and solutions; Elementary Linear Programming, Elementary Vector Algebra);
Calculus (limits and continuity, differentiation, integration, ordinary linear differential equation, partial differential equation),
Probability and Statistics (Counting, Permutations and Combinations)

**SECTION-B**

Note: The depth of subject matter in each subject shall be that of B.E./B.Arch./Relevant courses offered by T.U.

**Planning and Architecture** **[50 × 1]**

1. Planning [35]
   1.1. Urbanization in Nepal
   1.2. Historical Development and present state
   1.3. Problems of Urbanization in towns of Nepal
   1.4. Urban Services: Transportation, Water Supply, Sewerage, electricity
   1.5. Urban environment
   1.6. Municipalities and their programs to tide over the problems.
   1.7. Public/community participations in planning.

**2. Architecture**: **[15]**

   2.1. History of Architecture -Western, Eastern, Nepalese & contemporary
   2.2. Architectural Conservation
   2.3. Building environment – sustainable architecture, climatology etc.

**Civil & Agricultural Engineering (CA)** **[50 × 1]**

**1. Structural Engineering** **[10]**

Stress and strain, Bending and deflection and its equations, Statically determine structure: displacements by energy principles; static and kinematic indeterminacies; analysis of

indeterminate structures; slope-deflection and moment-distribution methods; influence lines for determinate and indeterminate structures; trusses; two and three hinged arches; analysis of trusses and frames; concepts of plastic analysis of beams.

**2. Geo-technical Engineering [10]**

Soil classification; three phase system, fundamental definitions, relationship and inter-relationships, permeability and seepage, effective stress principles, consolidation, compaction, shear strength.

Sub-surface investigation, drilling bore holes, sampling, penetrometer tests, plate load test; earth pressure theories, effect of water table, layered soils; stability of slopes-infinite slopes, finite slopes; foundation types- foundation design requirements; shallow foundations: bearing capacity.

**3. Water Resources Engineering [10]**

Physical properties, Fluid pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Euler's equation, Bernoulli's equation, Navier stokes equation Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump and its analysis, Similitude and physical modeling, Physical hydrology, Surface runoff, Rainfall-runoff correlation, Hydrograph Analysis, Unit hydrographs, Peak flow estimation.

**4. Transportation Engineering [10]**

Urban Road Net-work, Classification Roads (NRS), Requirements of Highway Alignment, Factors Controlling Highway Alignment, geometric elements of roads and their design parameters, highway Drainage System, Road Aggregate, Bituminous Road Binders, Traffic Studies, Traffic Control Devices, Road Intersections, design of Flexible pavements, construction and maintenance of bituminous roads, types of bridges, methods of tunneling.

**5. Water Supply & Sanitary Engineering [10]**

Introduction of Water Supply Engineering, Sources of water, Quantity of Water, Quality of Water, Intake Works, Water Treatments- natural, artificial, Sedimentation, Filtration, Disinfection, Reservoirs and Distribution System, Conveyance of water, Valves and Fittings. Introduction of sanitary engineering, Quantity of Waste Water, Characteristics and Examination of Sewage, Design and Construction of Sewers, Sewer Appurtenances, Sewage Disposal, sewage Treatment, Sludge Treatment and Disposal, Disposal of Sewage from Isolated Buildings, and Solid Waste management.

**Electrical Engineering (EE) [50 ×1]**

**1. Basic Electrical Circuits (10)**

- Circuit fundamentals: Series & parallel circuits, circuit elements, independent & dependent sources, Ohms law, Krichoff's Voltage & Current Laws

- Network Theorems: Thevenin's, Nortan's, Maximum power & Reciprocity Theorems
- AC circuits: Concept of complex impedance, Pharos diagram, Active, Reactive & Apparent power, Resonance in AC circuits
- Three phase circuits: Phase & line quantities in three phase system, 3-phase power
- Transient response: Transient response analysis for R-L, R-C & R-L-C circuits. Pole zero plots
- Two port Networks: Z -parameters, Y-parameters & ABCD-parameters

**2. Electrical Machines (10)**

- Electromagnets: Magnetic circuits, Fleming's Right hand & Left hand rules, Farady's Law of electromagnetic induction, electromechanical energy conversion principle
- Transformers: Equivalent circuits, Phasor diagrams, Losses & efficiency, Voltage regulations, Instrument transformers, three phase transformer connections, parallel operation of 1-1 & 3-1 Transformers
- Synchronous m/c: Operating principle, Effect of excitation, Power angle characteristics, Phasor diagrams, Losses & efficiency, Voltage regulations, parallel operation of alternator
- Induction machine: Operating principle, T-S Characteristics, Losses and efficiency, Testing, Starting methods, Speed control
- DC generator: Construction, Operating principle and characteristics of different types dc generator
- DC motor: Operating principle, Characteristics of different types dc motor, Speed control and starter

**3. Power Systems (20)**

- Transmission line: Line parameters, per unit system representation, single line diagrams, short, medium & long lines, efficiency & regulations, Transmission line design: selection of voltage, conductor, sag calculation, stringing chart, line insulators and string efficiency
- Distribution system: Radial and loop distribution, Rural and Urban Distribution system
- Economics of Generation: Load curve, Load duration curve, Diversity factor, Load factor, loss of load factor, tariff schemes
- Load flow: Bus classification, Y-bus formation, and Basic formulation of load flow problems
- Stability studies: Real and reactive power flow through transmission line, Steady state & transient stability limits
- Fault calculations: Symmetrical faults in power systems, grounded & ungrounded systems, over Voltages in transmission lines, surge arrestors
- Over voltage in transmission line: Power frequency lightening and switching over voltages, Surge arresters Relays and circuit breakers
- Protection equipment: Protection schemes: Over current, earth fault, differential & distance protection schemes
- Power control: Load -frequency control, VAR-Volt control
- Safety Engineering: Electric shocks, Equipment Earthing

**4. Basics Electronics** **(10)**

- Two terminal devices: Diode, Zener diode
- Transistor: BJT, FET, JFET, MOSFET
- Operational amplifier: Feedback, Summing, Integrator, Differentiator
- Logic circuits: Binary system, Truth tables, Logic gates
- Power Electronics: Thyristers, GTO, TRAIC, Rectifier, Inverter

**Electronics and Computer Engineering (EC)** **[50 × 1]**

**1. Electrical Circuit and System** **[5]**

- Ohms law, Kirchoff's laws
- The venin's, Norton's and maximum power transform theorem
- Active, reactive and apparent power (single & three-phase) and resonance
- Transient and steady state analysis, pole zero plots, two-port parameters.

**2. Electronics Circuit and System** **[10]**

- Integrated circuit technology and device models
- Operational Amplifier circuits
- Operational Amplifier characterization
- Power supplies and voltage regulators
- Untuned and tuned amplifiers
- Oscillator circuits
- Digital-to-Analog (DAC) and Analog-to-Digital (ADC) conversion
- Instrumentation and isolation amplifiers
- Operational amplifier-bipolar transistor logarithmic amplifiers
- Log-antilog circuit application
- Communication circuits
- Switched power supplies
- Introduction to power electronics.

**3. Computer Architecture** **[15]**

- Fundamentals of Computer Architecture & Organization
- Number System
- Boolean Algebra
- Logic Gates
- Combination and Sequential Logic
- A/D and D/A Conversion
- Memory
- Instruction Set

- Operating System and Application Program Concepts
- Computer Applications

**4. Communication System [4]**

- Analog and Digital Communication Theory and System

**5. Object Oriented Programming Languages [8]**

- Object oriented programming concepts
- Introduction to C++
- Operator Overloading
- Encapsulation
- Polymorphism
- Inheritance
- Templates and file handling

**6. Discrete Structure [8]**

- Propositional logic and predicate logic
- Methods of proof and formal reasoning
- Binary relations
- Finite state automata
- Recurrence Relation
- Graph theory and graph algorithms

**Mechanical & Industrial Engineering (MI) [50 ×1]**

**1. Thermodynamics and Heat Transfer [12]**

- Equality of Temperature and Zeroth Law of Thermodynamics, Heat Transfer and Work Transfer
- Control Mass and Control Volume Formulation of First Law, Steady State Applications
- Entropy, Second Law of Thermodynamics for an Isolated System, Control Mass and Control Volume Formulation of
- Second Law, Entropy Relations and Isentropic Process, Heat Engine, Heat Pump and Refrigerator
- Carnot Cycle, Brayton Cycle, Rankin Cycle, Otto Cycle, Diesel Cycle, Vapour Compression Cycle
- One dimensional steady state heat conduction through a plane wall, Radial steady state heat Conduction through a hollow cylinder, Heat flow through composite structures, Electrical Analogy for thermal resistance, Convection Fundamentals and Radiation Heat Transfer Fundamentals

**2. Fluid Mechanics and Fluid Machine [10]**

- Basic concepts of fluid and flow

- Flow measurement
- Continuity equation, Momentum equation, Bernoulli's equation and their applications
- Viscous flow, flow inside closed conduits and head losses
- Water turbines
- Water pumps

**3. Mechanics and Strength of Materials [12]**

- Concept of particles and rigid bodies
- Effect of forces on particles and rigid body
- Applications of equilibrium equations for solving problems of particles and rigid bodies (in 2-Dimensions and 3-dimensions.)
- Types of structures, statically determinate and indeterminate
- Moments and couples
- Distributed forces, C.G., Centroid, Area and mass moment of inertia,
- Kinematics of particles and rigid bodies
- Equations of motion
- Dynamic equilibrium
- Kinetics of particles and rigid bodies
- Applications of Newton's Second Law
- Application of Principle of Work and Energy
- Principle of Impulse and Momentum
- Conservation of Energy
- Concept of Stress and Strain
- Types of loads and beams
- Materials Properties and Material Testing
- Shear Force, Bending Moment diagram
- Torsion of Shafts
- Slope and deflection of beams.

**4. Energy [8]**

- Sources of conventional energy, fossil fuels, calorific values
- Renewable energy sources and their nature
- Basic concepts of: Solar thermal energy, Solar photo-voltaic energy, wind energy, Bio-mass, Geothermal energy and Hydraulic energy
- Consumption and environmental aspects of energy

**5. Industrial Engineering and Management [8]**

- Classification of manufacturing processes.
- Materials selection criteria.
- Elements of cost.
- Role of production, operation management and system concepts

- Production planning and control
- Plant location and plant layout design
- Forecasting techniques
- Inventory Control
- Decision making process
- Quality Assurance and Quality Control

**Applied Science (AS) [50 ×1]**

**1. Waves and Oscillation [5]**

Mechanical and Electromagnetic, Free, Damped and Forced oscillation, Wave motion, Energy, Power and intensity of plane progressive wave, Acoustic phenomena, Ultrasonics

**2. Electricity and Magnetism: [5]**

Electric and magnetic fields, potentials, DC and AC circuits, Maxwell's equations

**3. Heat and Thermodynamics: [4]**

Fundamentals of heat, calorimetry, Thermodynamics; First and Second laws and their Applications, Entropy, Transfer of heat; conduction, convection, radiation

**4. Optics: [4]**

Interference, diffraction, polarization, optical fibers

**5. Modern Physics: [7]**

Photoelectric effect, Quantization of energy, Lasers, Fission, Fusion
Energy and Environment: Renewable and Non Renewable Energy Resources, Ultraviolet Radiation, greenhouse effect, climate change

**6. Water: [3]**

Soft and hard, degree of hardness, alkalinity, specification for industrial and domestic purposes, Boiler feed water, sludge and scales, water treatment.

**7. Pollution: [4]**

Water pollution: Surface and ground water, water pollutants- visible, invisible: chemical and Microbiological, their adverse effect and remedies, Air Pollution; Air pollutants, SOx, NOx, COx, O3, hydrocarbons, particulates- dust, smoke and fly ash

**8. Electrochemistry: [3]**

Electrode potential and its measurement, standard electrode potential, electrochemical cells, Electrolytic cells, Nernst equation, EMF of cells, buffer, pH, corrosion, electrochemical series

**9. Catalysts:** **[1]**

Action of catalysts, characteristics and mechanism of catalysis,

**10. Transition metals:** **[2]**

Electronic configuration, properties and their applications

**11. Polymers:** **[2]**

Organic and Inorganic polymers, bio-degradable and non-bio-degradable, inducting polymers

**12. Fuel and combustion:** **[2]**

Classification, calorific values, coal, petroleum, kerosene, gasoline, biogas

**13. Explosives:** **[2]**

Classification, preparation and application

**14. Instrumental technique in chemical analysis:** **[2]**

Visible and ultraviolet spectroscopy, Nuclear Magnetic Resonance (NMR), atomic absorption Spectrometry (AAS)

**15. Isomerism:** **[1]**

Stereoisomerism-geometrical, optical

**16. Chemistry in daily life:** **[3]**

Carbohydrates, proteins, enzymes, nucleic acids, drugs and their classification- antacids, Antihistamines, neurologically active drugs- tranquilizers, analgesics, antimicrobials- antibiotics, Antiseptics and disinfectants, soaps and detergents

## 4. ACADEMIC RULES AND REGULATIONS

### 4.1. Duration of the Course and Barrier

The normal duration of the course for the fulfillment of the degree is two academic years. The Maximum period within which a student is allowed to complete the course is four academic years.

Only students able to secure minimum 50% of the total credit of any semester will be allowed to admit to the next semester. Unsuccessful students have to repeat the courses in which they failed and should pay course registration fee for those courses. (Rs 2000 per credit)

### 4.2. Course Structure

The course consists primarily of two types of courses: Core course and Elective courses. Core courses are mandatory whereas elective courses can be selected by the students. A student should take 24 credits of core courses, 16 credits of elective and/ or open elective courses, 4 credits of project and 16 credits of thesis. A student is allowed to take upto 20 credits of courses per semester.

### 4.2.1 Credit System

The curriculum is organized in the framework of credit system. Each course has a certain number of credits which indicates the weight. The number of credits depends on the contact hours for the course. Normally a course of 4 credits is designed for 4 contact hours of lecture classes plus tutorial, laboratory and assignment works per week, for 15 weeks of one semester. The tutorial on each course may include laboratory, simulation works, assignment and seminar works as prescribed by the department. Table-VI show the course structure for the Master Programs.

**Table-VI:** Course Structure and Credit System of M.Sc. Programs

| Year/Part | Core Courses | Elective Courses | Project | Thesis | Total Credits |
|---|---|---|---|---|---|
| I/I | 16 credits | 0-4 credits | | | 16-20 |
| I/II | 8 credits | 4-12 credits | | | 12-20 |
| II/I | | 0-8 credits | 4 credits | | 4-12 |
| II/II | | | | 16 credits | 16 |
| **Total** | **24 credits** | **16 credits** | **4 credits** | **16 credits** | **60 credits** |

### 4.2.2 Provision for Open Elective

Any student can take a maximum of 4 credits of open elective courses offered by other department whereas he/she can take a maximum of 8 credits of open elective courses offered by the other master programs of the same department.

### 4.2.3 Instructional Methods

The courses comprise Lectures, Tutorials, Laboratory works and seminars, short projects as applicable. The assignments would be given by the concerned faculty. Reference materials including international publications, journals, handbooks, web sites, related software etc. will be used as per necessity. The course contents are designed in such a way that considerably self-learning efforts should be applied by the students. Innovative approaches and ideas would be encouraged.

The evaluation is based on the internal evaluation and the final examination. The students have to pass separately in the internal evaluation as well as in the final examination. The minimum pass marks for the internal and final evaluation is 50%.

The internal evaluation is based on the continuous assessment by the course instructor. It is carried out by internal assessments, assignments, seminar works and other such activities.

The final evaluation is conducted at the end of semester by Examination Control Division, Institute of Engineering, Tribhuvan University.

The final percentage of marks is calculated by the following formula:

$$\text{Total percentage} = \frac{\Sigma(Credit\ x\ Marks\ Obtained)}{\Sigma Credits}$$

The marks percentage and division awarded will be as:

| **Percentage** | **Division** |
|---|---|
| 75 or above | Distinction |
| 65 to < 75 | First |
| 50 to < 65 | Second |

To qualify for the M.Sc. Degree, a student must satisfactorily complete all required coursework of at least 60 credits including an individual thesis work.

### 4.3. Elective Registration

Students should register themselves in the elective courses offered by the programs in that semester before the beginning of the class. For the open electives students of each program should apply to their respective program coordinator and he/she will precede it to the related program/department. Elective registration should be finalized by the program coordinator within first week from the beginning of the semester. Minimum number of students for each elective course should not be less than 6.

### 4.4. Thesis Registration

Students should pass all the core courses before registering to the thesis but have to pass all the courses including elective courses before its defense.

Students should submit thesis proposals to the respective Program Coordinator. They can consult available faculties for the preparation of thesis proposal. Different activities associated with thesis (Supervisor appointment, Proposal Defense, Midterm Defense, Final Defense) will be carried out by the Program supervisory committee. Minimum gap between the midterm thesis defense and the final thesis defense should not be less than 4 weeks.

Any student failing to defense within the regular 4th semester should take admission for the next consequent semester with additional exam fee of NRS 2,000/- and should defend as per Academic Calendar of IOE. S/he may apply for the extension to the maximum of one semester with the approval of supervisor without getting admission. It is the responsibility of the students to manage the resources for their thesis work.

**Note:** Campus won't arrange for the attestation of any testimonials. It is the candidate's responsibility to get authorized attestation of the testimonials.

The information given in this document (brochure) may be changed by the authorized person of the institute (IOE) if needed. The information given shall not be taken as obstruction for the implementation of such changes. If/When information from this brochure contradicts any other legal provision, it shall not be applied to that extent.