



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-2074**

**2018(2074)**



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

**Detailed Schedule for Entrance Examination of Masters Programs – 2074**

Time and Date for Online Application:

From 10 AM, 1<sup>st</sup>Falgun 2073 (13<sup>th</sup>February 2018)  
To 5 PM, 15<sup>th</sup>Falgun 2074 (27<sup>th</sup>February 2018)

Admit card can be downloaded during Falgun17-18, 2074 from the website:

<http://entrance.ioe.edu.np> OR [www.ioe.edu.np/entrance](http://www.ioe.edu.np/entrance)

Entrance Examination will be held at ICTC, IOE, Pulchowk:

19-20 Falgun2074 (March3-4, 2018)

Publication of Result:By 25<sup>th</sup>of Falgun, 2074 (By 9<sup>th</sup>March, 2018)

**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 16<sup>th</sup>Baisakh 2075 (29<sup>th</sup>April, 2018)**

त्रि.वि. इन्जिनियरिङ्ग अध्ययन संस्थानद्वारा शैक्षिक बर्ष २०७४/०७५ मा संचालन गरिने स्नातकोत्तर तहको प्रवेश परीक्षा उत्तीर्ण गर्ने परीक्षार्थीहरू नेपाल सरकार, शिक्षा मन्त्रालयको छात्रवृत्ति सम्बन्धी नियमावली अनुसार तोकिएको कानुनी मापदण्ड पुरा गरेमा सो मन्त्रालयद्वारा २०७४/०७५ मा प्रदान गरिने स्नातकोत्तर तहका उच्च शिक्षाका छात्रवृत्तिहरूका 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 Thapathali 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 Communication and Knowledge 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](http://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<sup>th</sup> of Falgun 2074 (1<sup>st</sup> March, 2018) onwards from the website: <http://entrance.ioe.edu.np>. Applicants should bring the admit card and the mentioned original identification document with him/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 and Started Date	Offered By
<b>Pulchowk Campus, Lalitpur</b>	Information & Communication Engineering (2001)	Department of Electronics and Computer Engineering
	Computer Systems and Knowledge Engineering (2012)	
	Power System Engineering (2001)	Department of Electrical Engineering
	Structural Engineering (1996)	Department of Civil Engineering
	Water Resources Engineering (1996)	
	Environmental Engineering (1996)	
	Geotechnical Engineering (2001)	
	Transportation Engineering (2011)	
	Disaster Risk Management (2011)	
	Construction Management (2013)	
	Hydropower Engineering (2017)	Department of Mechanical Engineering
	Renewable Energy Engineering (2001)	
	Energy Systems Planning and Management (2012)	
	Technology and Innovation Management (2010)	
	Mechanical Systems Design and Engineering (2016)	Department of Science and Humanities
	Material Science & Engineering (2014)	
	Climate Change and Development (2013)	
	Applied Mathematics (2017)	Department of Architecture
Urban Planning (1996)		
Energy for Sustainable Social Development (2015)		
Energy Efficient Buildings (2016)		
<b>Thapathali Campus, Kathmandu</b>	Earthquake Engineering (2014)	Department of Civil Engineering
	Mechanical Engineering Design and Manufacturing (2016)	Department of Mechanical & Automobile Engineering
<b>Paschimnchal Campus, Pokhara</b>	Communications and Knowledge Engineering (2014)	Department of Electronics and Computer Engineering
	Distributed Generation Engineering (2014)	Department of Electrical Engineering
	Infrastructure Engineering and Management (2014)	Department of Civil Engineering
<b>Purwanchal Campus</b>	Land and water Resources Engineering (2017)	Department of Civil and Agriculture 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<sup>th</sup> of the sponsored quota is reserved for the Foreign students.
3. Priority for the sponsored quota will be as follows:  
 1<sup>st</sup> Priority: Candidates from government offices & Government Owned Organizations or Companies  
 2<sup>nd</sup> 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<sup>th</sup> 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 from 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 2018-2020, applicant should submit his/her necessary documents (application form, bachelor transcripts and degree certificates, recommendation letter, motivation letter (Statement of Purpose), scanned copy of 1<sup>st</sup> page of the passport) via email at [admission@ioe.edu.np](mailto:admission@ioe.edu.np) on or before 27<sup>th</sup> February, 2018. 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	B.Arch./B.E Civil or equivalent
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 equivalent.
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/ Automobile or Equivalent.
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 equivalent.
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 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	MI	B.E Mechanical/Industrial or Equivalent

SN	Programs	Entrance Streams	Pre-Requisite Degree
23.	Mechanical Systems Design and Engineering	MI	B.E Mechanical/Industrial or Equivalent
24.	Energy Efficient Buildings	PA/CA	B.E Civil, B.Arch. or Equivalent
25.	Applied Mathematics (Proposed)	AS	B.E/ B.Sc. Agriculture/ M.Sc. Science for 3 years bachelor degree/B.Sc. Science(4 years) or equivalent
26.	Hydropower Engineering (Proposed)	CA	B.E Civil or Agriculture or equivalent
27.	Land and Water Resources Engineering	CA	B.E Agriculture or Civil or equivalent

- Have undergraduate grades significantly above average and not less than prescribed 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** consists of 45 numbers of questions of 50 marks. While **Section-B** consists of stream specialized course with 50 numbers 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 has passed the relevant bachelor degree and fulfills the program entry requirements will be selected for the admission on the basis of merit list based on the score of the Entrance examination.
- ❖ 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
- ❖ 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/-	55,000/-	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/-	64,175/-	❖ 5,46,175/-	US \$2,060/-
<p>1. Students admitted to Hydropower Engineering and Land and Water Engineering have to pay additional Rs. 50,000/- for field visit and practical works.</p> <p>2. TU Registration fee Rs 500/- (Rs 1000/- for the students passing B. E. or equivalent from abroad) and Graduate Conference fee of Rs 5,000/- for all students.</p> <p>3. 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.</p>				

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 for the reimbursement of fees:

- 25% deduction from tuition fee of one semester prior to the start of class.
- 50% deduction from tuition fee of one semester till 7<sup>th</sup> day after the start of class.
- No refund of tuition fees and nonrefundable deposits following the 7<sup>th</sup> day from the commencement of the class.

### 3. CURRICULUM FOR M.Sc. ENTRANCE EXAMINATION - 2074 (2018)

The M.Sc. Entrance examination will be “Computer Based Examination” of two hours duration, consisting of two sections.

**Section- A** consists 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.

#### Communication English

[10]

##### 1. Critical Reasoning

[6]

Critical reasoning section aims 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 and their implications. This section measures reading comprehension and critical reasoning skills in multiple-choice format.

The critical reasoning section measures your ability to

- (a) Analyze and evaluate a written text and synthesize information obtained from it.
- (b) Analyze relationships among component parts of sentences.

- Text Completion/Sentence equivalence: [2x1=2]

- Reading Passages: [2x 2 =4]

##### 2. Error Analysis

[2x1=2]

This section measures your ability to

- Write sentences without any error
- Write proposals, reports, seminars, research article, dissertations, etc. by using most suitable words and technical terms efficiently.

##### 3. Analogies

[2x1=2]

This section measures your ability to explain the relation between two words.

#### Mathematics

[40x1]

The format of the 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

#### Mathematics – A (B-Arch)

##### 1. Basic Mathematics

[4]

- Sets and Functions,
- Two dimensional and three dimensional Coordinate Geometry,

##### 2. Algebra

[10]

- Polynomials
- Complex numbers
- Sequence and series

- Permutation and combination
  - Equations and inequalities
  - Matrices and Determinants
  - Linear Programming
- 3. Vector Analysis** [6]
- Vector Algebra: Vectors and Scalars, product of two, three and four vectors, reciprocal system
  - Vector Calculus: Gradient, Curl and Divergence
- 4. Calculus** [13]
- Limits and Continuity, Ordinary and Partial Differentiation
  - Indefinite and definite Integration
  - Application of Derivatives and Anti-derivatives
  - Ordinary Differential Equations.
- 5. Elementary Statistics and Probability** [3]
- 6. Elementary Trigonometry, Logarithm** [4]

**Mathematics – B (For all except B-arch)**

- 1. Basic Mathematics** [3]
- Sets and Functions,
  - Two dimensional and three dimensional Coordinate Geometry,
- 2. Algebra** [8]
- Polynomials
  - Complex numbers
  - Sequence and series
  - Permutation and combination
  - Equations and inequalities
  - Matrices and Determinants
  - Eigen values and Eigen vectors, Diagonalization of matrix
  - Linear Programming
- 3. Vector Analysis** [6]
- Vector Algebra: Vectors and Scalars, product of two, three and four vectors, reciprocal system
  - Vector Calculus: Gradient, Curl and Divergence, line integral, surface integral and volume integral.
- 4. Calculus** [12]
- Limits and Continuity, Ordinary and Partial Differentiation
  - Indefinite and definite Integration
  - Application of Derivatives and Anti-derivatives
  - Ordinary Differential Equations.
- 5. Elementary Statistics and Probability** [3]
- 6. Elementary Trigonometry, Logarithm** [4]
- 7. Transforms: Laplace transform, Fourier Series** [4]

## SECTION-B

The depth of subject matter in each subject of stream specialized course shall be that of B.E./B.Arch. level relevant courses offered by T.U.

### Applied Science (AS)

[50

x1]

#### 1. Mechanical Waves & Oscillations

[5]

- Wave motion: Mechanical wave, Velocity of wave, energy, power & Intensity; stationary wave
- Acoustic phenomena: Echo & reverberation, beats, modes of vibration in string and pipes
- Ultrasound: production, applications

#### 2. Heat & Thermodynamics

[4]

- Fundamentals of heat: Calorimetry, Change of state
- Transfer of heat: Conduction, convection and radiation
- Thermodynamics: Gas laws, kinetic theory of gas, first law of thermodynamics, second law of thermodynamics,
- Applications: Entropy, heat engines, refrigerators

#### 3. Electromagnetic Waves & Oscillations

[8]

- Electric and Magnetic fields: Intensity, potential, potential gradient, capacitors
- DC and AC Circuit: LR, LC, RC, LR, LCR circuits
- Maxwell's Equations: Gauss law, Faradays law of electromagnetic induction, Ampere's law & its modification
- Wave optics: Interference, diffraction, polarization, optical fibers

#### 4. Modern Physics

[8]

- Electrons:  $e$ ,  $e/m$ , motion of electron in electric and magnetic fields
- Photoelectric Effect: Einstein's equation, solar cell, Photovoltaic cell
- Advanced Materials: Semiconductor, dielectric materials, magnetic materials, superconductor, nano-technology & materials
- Quantization of energy: Bohr's theory, energy level, wave-particle duality, uncertainty principle, Laser.
- Radioactivity: radioactive disintegration, fission, fusion
- Energy and Environment: Renewable and non-renewable energy resources, ultraviolet radiation, green-house effect, climate change.

#### 5. Chemistry in Daily Life

[3+2]

- Carbohydrates, proteins, enzymes, nucleic acids, drugs and their classifications- antacids, antihistamines, neurologically active drugs- tranquilizers, analgesics, antimicrobials-antibiotics, antiseptics and disinfectants, soaps and detergents.
- Organic and Inorganic polymers, biodegradable and non-biodegradable, conducting polymers

- 6. Environmental Chemistry** [4]
- Water Pollution: Surface and ground water pollution, water pollutants-visible and invisible, chemical and microbiological, their adverse impacts and remedies.
  - Air Pollution: Air pollutants, gases SO<sub>x</sub>, NO<sub>x</sub>, CO<sub>x</sub>, O<sub>3</sub>, hydrocarbons, particulate-dusts, smokes and fly ash.
- 7. Water** [3]
- Soft and hard, degree of hardness, alkalinity, specification for domestic and industrial purposes, boiler feed water, sludge and scale, water treatment.
- 8. Catalysts** [1]
- Action of catalysts, characteristics and mechanism of catalysis.
- 9. Electrochemistry** [3]
- Electrode potential and its measurements, standard electrode potential, electrochemical cells, electrolytic cells, Nernst equation, EMF of cells, buffer, pH, corrosion, electrochemical series,
- 10. Applied Chemistry** [2+2]
- Fuel and Combustion: classification calorific values, coal, petroleum, kerosene, gasoline, biogas.
  - Explosives: classification, preparation and applications.
- 11. 3d Transition Elements** [2]
- Electronic configuration, oxidation states, complex formation, alloy formation and magnetic properties.
- 12. Isomerism** [1]
- Stereoisomerism- geometric isomerism, optical isomerism.
- 13. Instrumental Technique in Chemical Analysis** [2]
- Visible and ultraviolet spectroscopy, nuclear magnetic resonance (NMR), atomic absorption spectroscopy (AAS)

**Architecture and Planning (AP)**

[50×1]

- 1. Architecture** [35]
- 1.1 History of Architecture [5]
- 1.1.1 History of Nepalese Architecture
- 1.1.2 History of Easter Architecture
- 1.1.3 History of Western Architecture
- 1.1.4 History of Contemporary Architecture
- 1.2 Building Material and Technology [5]
- 1.2.1 Building Material-Brick, Timber, Cement, Stone, Aluminum, Mud etc.
- 1.2.2 Building Technology - Load Bearing, Frame Structure, different wall, roof, floor, etc.
- 1.3 Building Science [5]
- 1.3.1 Climatology
- 1.3.2 Thermal Aspects
- 1.3.3 Architectural Lighting

1.3.4	Architectural Acoustics	
1.4	Green Building Design	[5]
1.4.1	Green Building Design Concept	
1.4.2	Green Building Rating System –LEED, GRIHA, CASBEE, etc.	
1.4.3	Passive and active Solar Architecture	
1.4.4	Examples of Green Building and Planning	
1.5	Architecture and conservation	[5]
1.5.1	Historical monument and building of Nepal and World	
1.5.2	Architectural Conservation of Nepal	
1.6	Contemporary Architecture of Nepal	[5]
1.6.1	Contemporary Architectural practices of Nepal	
1.6.2	Problem and way out for future in Nepal	
1.7	Building Services	[5]
1.7.1	Electrical Service – Artificial lighting system, Solar Lighting	
1.7.2	Mechanical Service – HVAC, Lift, Escalator, Solar water heating, etc.	
1.7.3	Water Supply and Sanitation	
<b>2.</b>	<b>Planning</b>	<b>[15]</b>
2.1	History of Planning – Ancient Town and Settlement	[5]
2.2	Urban problems in towns of Nepal	[5]
2.3	Urban Environment and Urbanization in Nepal	[5]

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

**1. Structural Engineering**

**[10]**

Stresses and strains, Bending and deflection and its equations, Statically determinate 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 and frames.

**2. Geo-technical Engineering**

**[10]**

Phase relationship, soil classification, clay mineralogy, soil compaction, permeability, principal of effective stress, seepage analysis, stress distribution, consolidation, shear strength of soil, stability of slopes, soil exploration, earth pressure theories, rigid and flexible retaining structures, bearing capacity and settlement of shallow foundations, analysis of deep foundation (pile, pier, well), foundation soil improvement.

**3. Water Resources Engineering**

**[10]**

Physical properties of Fluid, 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 and statistical hydrology, Flood routing.

#### **4. Transportation Engineering**

[10]

Road transportation in Nepalese context, Highway alignment, Geometric design, Highway drainage system, Highway materials, Traffic Studies, traffic control devices and measures, Road intersection and design, Road pavement, Construction and maintenance of road pavements, Bridge type, site selection, components and protection structures, Tunnel components, requirements and methods of tunneling

#### **5. Water Supply & Sanitary Engineering**

[10]

Introduction of Water Supply Engineering, Sources of water, Quantity of Water, WHO guidelines, Nepal Drinking water quality standards, 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, Solid Waste management, WASH and Ecosan.

### **Electrical Engineering (EE)**

[50x1]

#### **1. Basic Electrical Circuits**

[10]

- Network Theorems: Thevenin's, Norton's, Maximum power & Reciprocity Theorems
- AC circuits: Concept of complex impedance phasor 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 circuit. 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 machine: 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, sort, 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 G-S & N-R load flow methods
- Stability studies: Swing equations, equal area criterion, Stability enhancement techniques Series & shunt compensations
- Fault calculations: Symmetrical & unsymmetrical faults in power systems, grounded & undergrounded systems, over Voltages in transmission lines, surge arrestors
- Over voltage in transmission line: Temperature over voltage, switching over voltages and lightning overvoltage
- Relays and circuit breakers: Instantaneous & IDMT relays, ABC, VCB & gas circuit Surge arresters brasses, differential & distance protection schemes
- Power control: Load-frequency control, VAR-Volt control
- Safety Engineering: Electric shocks, Equipment Earthing Mat earthing of power stations, measurement of earth resistivity and earth resistances

### 4. Power Electronics

- Power electronics devices: Diode, IGBT, BJT, MOSFET
- Operational amplifier: Thyristers, GTO, TRAIC
- Rectifiers: Single Phase & three phase rectifiers, uncontrolled and controlled rectifiers
- Inverters: single phase & three phase invertors
- Choppers: Step up and step down choppers, chopper Classifications.

[10]

## Electronics and Computer Engineering (EC)

[50x1]

### 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** **[10]**
- 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. Computer Networks** **[5]**
- 5. Communication System** **[4]**
- Analog and Digital Communication Theory and System
- 6. Object Oriented Programming Language** **[8]**
- Object oriented programming concepts
  - Introduction to C++
  - Operator Overloading
  - Encapsulation
  - Polymorphism
  - Inheritance
  - Templates and file handling
- 7. 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)**

[50x1]

### **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
- 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
- IC Engines

### **2. Fluid Mechanics and Fluid Machine**

[10]

- Basic concepts and 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
- Turbo machines
- 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
- Mechanical Design

### **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

## **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 up to 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
<b>Total</b>	<b>24 credits</b>	<b>16 credits</b>	<b>4 credits</b>	<b>16 credits</b>	<b>60 credits</b>

#### 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:

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

The marks percentage and division awarded will be as:

<u>Percentage</u>	<u>Division</u>
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. She/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.

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