



Tribhuvan University
Institute of Engineering
Entrance Examination Board

Information Brochure

Entrance Examination and Admission Procedure for M.Sc. Programs

IOE Entrance Examination Board-2076

2020
(2076)



Tribhuvan University
Institute of Engineering
Entrance Examination Board

Detailed Schedule for Entrance Examination of Masters Programs – 2076

Time and Date for Online Application:

From 10 AM, 17th Magh 2076 (31st January 2020)
To 3 PM, 2nd Falgun 2076 (14th February 2020)

Admit card can be downloaded from: 7th Falgun 2076 (19th February 2020)

From website: www.ioe.edu.np or <https://entrance.ioe.edu.np/>

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

From 11th Falgun 2076 (23rd February 2020)

Publication of Result: 16th Falgun, 2076 (28th February 2020)

To be eligible for Masters Entrance application, the candidate must have passed Bachelor degree in relevant subjects with at least second division or equivalent

Admission Notice for the successful candidates shall be published by the Admission Committees of Constituent Campuses of IOE. The Academic session starts from 16th Baisakh 2077 (28th April 2020)

त्रि वि इन्जिनियरिङ्ग अध्ययन संस्थानद्वारा शैक्षिक वर्ष २०७६।०७७ मा संचालन गरिने स्नातकोत्तर तहको प्रवेश परीक्षा उत्तीर्ण गर्ने परिक्षार्थीहरू नेपाल सरकार, शिक्षा मन्त्रालयको छात्रवृत्ती सम्बन्धी नियमावली अनुसार तोकिएको कानुनी मापदण्ड पुरा गरेमा सो मन्त्रालयद्वारा २०७६।०७७ मा प्रदान गरिने स्नातकोत्तर तहका उच्च शिक्षाका छात्रवृत्तीहरूका लागि समेत उमेदवार हुन योग्य हुनेछन ।

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1 INTRODUCTION

1.1 History of IOE

History of engineering education in Nepal can be traced since 1942, when Technical Training School was established. Engineering section of the school offered only trades and civil sub-overseer's 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 to constitute the Institute of Engineering and the Nepal Engineering Institute and the Technical Training Institute were renamed as Pulchowk Campus and Thapathali Campus respectively.

Since then, the Institute of Engineering 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 and, 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. Similarly, Bachelor's Program in Aerospace Engineering and Chemical Engineering was started in 2018 and 2019 respectively at Pulchowk 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.

1.1. 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. Currently, there are total 23 different M.Sc programs in Pulchowk Campus. Pulchowk Campus has also started regular Ph.D. admission from academic session 2010/11 in all departments. IOE has also expanded Master's program in other constituent campuses since 2014 (2071 BS). Currently, there are three, five and one M.Sc programs in Thapathali Campus, Paschimanchal Campus and Purwanchal Campus respectively. A category-wise

detail of thirty-two different Master Programs' intake capacity is given in Section 1.4 in Table I and Table II.

1.2. 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: <https://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 by filling applicant's name and date of birth in it. The Candidate can also deposit an amount of Rs.2000 using Siddhartha BankSmart, e-Sewa or connectIPS. The Voucher No. / Transaction ID No. 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

If any change has to be done on the submitted information in application form, the applicant should submit request for correction with the Bank voucher. Applicant has to pay NRs 150 to edit six or less number of normal text fields. For low resolution photo or Identification document change he/she has to pay NRs 200.00. For name, photo or ID document correction, he/she has to pay NRs 500. This amount must be deposited in the account whose description is provided below:

Bank Name : Himalayan Bank Ltd.

Account Name : IOE, Entrance Examination Board

Account No : 00602291940013

1.3. Provision of Admit Cards

Admit card can be downloaded from 7th Falgun 2076 (19th February, 2020) onwards from the website: <https://entrance.ioe.edu.np>. Applicants should bring the color printed 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.

1.4. Intake Capacities

The quota distribution for all M.Sc. Programs on current intake capacities is listed in 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 Program	5	1	6	8	20

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 minimum 3 years as a contract faculty. If there is no applicant in IOE reserve quota, it is added to Full Fee Seat. 1/4th of the sponsored quota is reserved for the foreign students in each program.
3. Priority for the sponsored quota will be as follows:
 - First Priority: Candidates from government offices & Government Owned Organizations or Companies
 - Second Priority: Other Organizations
4. If applications are not received in sponsored/foreign category, then the seat will be fulfilled as Full Fee category.
5. In any program, if 60% of the full fee and sponsored seats are not fulfilled within first phase (first, second and third admission list) of the admission, that program must be suspended for that academic year by the concerned campuses and the amount paid by the candidate in the admission process must be refunded.

Table -II M.Sc. Program and Offering Departments

Campus	Master Programs and Started Date	Department
Pulchowk Campus, Pulchowk, Lalitpur	1. Information & Communication Engineering (2001)	Electronics & Computer Engineering
	2. Computer System and Knowledge Engineering (2012)	
	3. Computer Engineering Specialization in Data Science and Analytics (2020)	
	4. Power System Engineering (2001)	Electrical Engineering
	5. Structural Engineering (1996)	Civil Engineering
	6. Water Resources Engineering (1996)	
	7. Environmental Engineering (1996)	
	8. Geotechnical Engineering (2001)	
	9. Transportation Engineering (2011)	
	10. Disaster Risk Management (2011)	
	11. Construction Management (2013)	
	12. Hydropower Engineering (2018)	
	13. Renewable Energy Engineering (2001)	Mechanical Engineering
	14. Technology and Innovation Management (2010)	
	15. Energy Systems Planning and Management (2012)	
	16. Mechanical Systems Design and Engineering (2016)	Applied Sciences and Chemical Engineering
	17. Material Science & Engineering (2014)	
	18. Climate Change and Development (2013)	
	19. Applied Mathematics (2018)	Architecture
	20. Urban Planning (1996)	
	21. Energy for Sustainable Social Development (2015)	
	22. Energy Efficient Buildings (2016)	
	23. Architecture (2020)	
Thapathali Campus, Kathmandu	24. Earthquake Engineering (2014)	Civil Engineering
	25. Mechanical Engineering Design and Manufacturing (2016)	Mechanical & Automobile Engineering
	26. Informatics and Intelligent Systems Engineering (2020)	Electronics and Computer Engineering
Paschimnchal Campus, Pokhara	27. Communications and Knowledge Engineering (2014)	Electronics and Computer Engineering
	28. Distributed Generation Engineering (2014)	Electrical Engineering
	29. Infrastructure Engineering and Management (2014)	Department of Civil Engineering
	30. Rock and Tunnel Engineering (2020)	
	31. Geospatial Engineering (2020)	Geomatics Engineering
Purwanchal Campus, Dharan	32. Land and Water Engineering (2018)	Civil and Agriculture Engineering

1.5. Provision for the Foreign Students

1/4th 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 (four years) in engineering in relevant subjects with at least second division or equivalent. (See Section 2 for entry requirements of relevant streams in Bachelor to be enrolled in corresponding Master's Degree program).
2. Foreign citizens who have completed bachelor or equivalent degree from Colleges/Universities within Nepal should appear in the entrance examination by the normal entrance procedure. To enroll for the academic year 2020-2022, the applicant in this category should submit the followings:
 - a) Online Application Form.
 - b) Transcripts and Degree Certificates of Bachelor of Engineering Degree in required stream.
 - c) Scanned copy of the passport.

All these documents must be submitted via email at admission@ioe.edu.np within 14th February, 2020.

3. Foreign citizens who completed bachelor or equivalent degree from Foreign Colleges/Universities outside Nepal must appear for test as prescribed by the Entrance Examination Board. To enroll for the academic year 2020-2020, the applicant in this category should submit the followings:
 - a) Online Application Form.
 - b) One recommendation letter from the past University subject instructor/supervisor or mentor.
 - c) Transcripts and Degree Certificates of Bachelor of Engineering Degree in required stream. The degree should be accredited by the concerned body of TU for admission.
 - d) One-page motivation letter not exceeding 500 words mentioning candidate's interest to study masters at IOE, TU, Nepal.
 - e) Scanned copy of the passport.

All these documents must be submitted via email at admission@ioe.edu.np on or before 14th February, 2020. Candidate will be informed for test via telephone or email.

4. He / She is required to follow the enrollment process, procedure and schedule as notified by the campuses.

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: Prerequisite Degree Requirements for M.Sc. Programs

SN	Programs	Eligibility Requirements	
		Entrance stream	Pre requisite degree
1.	Urban Planning	PA/CA	B.Arch./B.E. (Civil) M.A.(Geography) or equivalent
2.	Information & Communication Engineering	EC	B.E. (Electronics/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/Automobile/Industrial) or Equivalent
6.	Water Resources Engineering	CA	B.E. (Civil or Agriculture) or equivalent
7.	Geo-Technical Engineering	CA	B.E. (Civil) or equivalent.
8.	Transportation Engineering	CA	B.E. (Civil) or Equivalent
9.	Technology and Innovation Management	Any	B.E. in any field/B.Arch. or Equivalent
10.	Disaster Risk Management	Any	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/Software, Information Technology) or Equivalent
13.	Environmental Engineering	CA	B.E. (Civil or Agriculture) or equivalent
14.	Construction Management	CA/PA	B.E. (Civil or Agriculture) or B.Arch. or equivalent
15.	Climate Change and Development	Any	B.E in any field/B.Arch. /B.Sc. Agriculture/B.Sc. Forestry/B.Sc. (4 years) or equivalent
16.	Material Science and Engineering	Any	B. E. in any field/B.Arch. / B.Sc. Agriculture / M. Sc. for 3-year Bachelor degree, B.Sc. (4 years) or equivalent
17.	Energy for Sustainable Social Development	PA/CA/MI	B.Arch./B.E. in Civil/ Mechanical/ Automobile/ Industrial and Agriculture Engineering or equivalent
18.	Earthquake Engineering	CA	B.E. (Civil) or equivalent
19.	Infrastructure Engineering and Management	CA	B.E. (Civil) or equivalent
20.	Communication and Knowledge Engineering	EC	B.E. (Electronics & Communication, Electrical & Electronics/Computer) or Equivalent

21.	Electrical Engineering in Distributed Generation	EE	B.E. Electrical or Equivalent
22.	Mechanical Engineering Design and Manufacturing	MI	B.E. Mechanical/ Automobile/ Industrial or Equivalent
23.	Mechanical Systems Design and Engineering	MI	B.E. Mechanical/Industrial/Automobile or Equivalent
24.	Energy Efficient Buildings	PA/CA	B.E. Civil/B.Arch. or Equivalent
25.	Applied Mathematics	CA/EE/EC/MI/AS/GE	B.E. in any field Except B.Arch./B.Sc. (4 years) with Major Math or Physics/ B.A. (4 years) with Major Math/M.A. or M.Sc. for 3 years bachelor degree or equivalent
26.	Hydropower Engineering	CA	B.E. Civil or Agriculture or equivalent
27.	Land and water Engineering	CA	B.E. Agriculture/Civil or equivalent
28.	Rock and Tunnel Engineering	CA	B.E. (Civil) or equivalent
29.	Informatics and Intelligent Systems Engineering	EC	B.E. (Electronics/Computer/Software/ Information Technology) or Equivalent
30.	Geospatial Engineering	GE	B.E. Geomatics or equivalent
31.	Architecture	PA	B.Arch. or equivalent
32.	Computer Engineering Specialization in Data Science and Analytics	EC	B.E. (Electronics/Computer/Software/ Information Technology) or Equivalent

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

- Have undergraduate grades 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.
- In the case of AMIE applicants, the applicants must produce the certificate of completion of pre-requisite courses for B.E. equivalence as prescribed by IOE.
- Equivalent certificate must be submitted at the time of admission.

2.2 Mode of Entrance Examination

The candidate should appear in one of the streams (listed in Table-IV) of entrance examination and qualify for admission in relevant Master Program at IOE.

Table-IV: Entrance Streams and Code

S. No.	Entrance Stream	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
7	Geomatics Engineering	GE

- Entrance examination will be of Computer Based Multiple Choice Type of 2 hours duration consisting of two sections. **Section- A** consists of 45 questions for 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 Result Publication

The Entrance Examination Board of IOE will publish the list of the successful candidates in the entrance examination notice board as well as in the website: <https://entrance.ioe.edu.np/> on 16th Falgun, 2076 (28th February, 2020). After publication of the result the Admission Committee of Constituent campuses will take care of admission procedure. So, all the successful candidates are requested to contact respective Constituent Campuses for Admission procedure.

2.4 Selection Process for Admission

- ❖ The successful candidate in entrance exam who has passed the relevant bachelor degree should submit the admission form of corresponding campuses
- ❖ From the list of applicants for any M. Sc. Program the applicant will be selected for the admission on the basis of score of the Entrance examination and his/her preferred M. Sc. Program.
- ❖ Admission committees of respective Campuses will publish the list of admission as per its schedule. The candidates should contact the respective 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 applying candidates from the subsequent lists.
- ❖ Sponsored candidates are processed in the first admission list only.

2.5 Admission

- ❖ The candidate who is listed on admission list of campuses 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 certificates, if applicable.
 - Original copy of Nepali citizenship certificate, passport for foreign students
 - Copy of Score Card of entrance examination.
- ❖ 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 in second division.**

Note:

In any program, if 60% of the full fee and sponsored seats are not fulfilled within first phase (first, second and third admission list) of the admission, that program must be suspended for that academic year by the concerned campuses and the amount paid by the candidate in the admission process must be refunded.

2.6 Fee Structure

Fees arrangement for Master's Program will be as follows:

	Regular	Full fee	Sponsored	Foreign Student
Tuition fee (Per Semester)	12,180/-	55,000/-	1,48,500/-	US \$ 1,980/-
Exam Fee (Per Semester)	2,000/-	2,000/-	2,000/-	US \$ 20/-
Application Processing Fee (Per Semester)	100/-	100/-	100/-	US \$ 1/-
Exam Centre Fee (Per Semester)	100/-	100/-	100/-	US \$ 1/-
Deposit (Refundable)				
Campus Deposit	1,000/-	1,000/-		US \$ 10/-
Lab Deposit	1,000/-	1,000/-		US \$ 10/-
Library Deposit	1,000/-	1,000/-		US \$ 10/-
Deposit (Nonrefundable)				
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	22,555/-	65,375/-	602,975/-	US \$ 2,252/-
<ol style="list-style-type: none"> Students admitted to Hydropower Engineering and Land & Water Engineering have to pay additional Rs. 50,000.00 for field visit and Practical Works. Students admitted to Rock and Tunnel Engineering have to pay additional Rs. 14,800/- per semester for Lab Expenses and Rs. 20,650 per semester for Field Expenses. Students admitted to Geospatial Engineering have to pay additional Rs. 14,800/- per semester for Lab Expenses. TU Registration fee Rs. 500.00 (Rs. 1000.00 for the students passing B.E./ B.Arch. or equivalent from abroad) and Graduate Conference fee of Rs. 5000/- for all students. The candidate under sponsored category should 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 will not be entertained. 				

The candidates should pay extra charge for Internet access separately during admission as per the college rule and any extra service as per specified by TU. The given fee structure is for completing the minimum specified courses within two years of academic sessions. 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 regulations.

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

- a. 25% deduction from tuition fees prior to the start of class.
- b. 50% deduction from tuition fees till 7th day after the start of class.
- c. No refund of tuition fees and nonrefundable deposits following the 7th day from the commencement of the class.

2.7 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.

2.8 Refund Policy of Campus Deposit

The Students who have completed their M.Sc. degree should claim the refundable deposit amounts within one year of the completion, otherwise Campuses will not be responsible. The deposit amounts of those students, who have dropped out the study of M.Sc. program without completion, won't be refunded.

3 CURRICULUM FOR M.Sc. ENTRANCE EXAMINATION

The M.Sc. Entrance examination will be “**Computer Based Examination**” of two hours duration, consisting of two sections. **Section- A** consists of 45 questions for 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 for each wrong answer is 10%.

3.1 SECTION-A

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

3.1.1 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:

[2x2=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.

3.1.2 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]
<ul style="list-style-type: none"> • Polynomials • Complex numbers • Sequence and series • Permutation and combination • Equations and inequalities • Matrices and Determinants • Linear Programming 	

3. Vector Analysis	[6]
<ul style="list-style-type: none"> • Vector Algebra: Vectors and Scalars, product of two, three and four vectors, reciprocal system • Vector Calculus: Gradient, Curl and Divergence 	

4. Calculus	[13]
<ul style="list-style-type: none"> • 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]
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6. Elementary Trigonometry, Logarithm	[4]
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Mathematics – B (For all except B-arch)

1. Basic Mathematics	[3]
<ul style="list-style-type: none"> • Sets and Functions, • Two dimensional and three-dimensional Coordinate Geometry, 	

2. Algebra	[8]
<ul style="list-style-type: none"> • 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]
<ul style="list-style-type: none"> • 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]
<ul style="list-style-type: none"> • 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]

3.2 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.

3.2.1 Applied Science (AS) [50x1]

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, anti-septic's and disinfectants, soaps and detergents.
 - Organic and Inorganic polymers, biodegradable and non-bio degradable, 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 SOX, NOX, COX, O3, 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)

3.2.2 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	
2.	Planning	[15]
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]
3.2.3	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.

3.2.4 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, Faraday'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, 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 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 [10]

- Power electronics devices: Diode, IGBT, BJT, MOSFET
- Operational amplifier: Thyristors, GTO, TRIAC
- 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.

3.2.5 Electronics and Computer Engineering (EC) [50x1]

1. Electrical Circuit and System [5]

- Ohms law, Kirchhoff's laws
- Thevenin's Norton's and maximum power transfer 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

3.2.6 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, Biomass, 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

3.2.7 MSc in Geospatial Engineering (GE) (50x1)

1. Traditional Surveying, Survey Networks and Modern Techniques of Surveying [12]

- Fundamentals of surveying; triangulation and trilateration; bathymetric survey for determination of depth of waterbodies and profile and cross-sections including discharge measurements; setting out of building, road, bridges and other structures; national trig points, reference level surface (orthometric, ellipsoid, geoid) and gravity measurement; principles of photogrammetry and remote sensing, application of photogrammetry and remote sensing; flight planning; photogrammetric products; different systems of remote sensing; distortions in satellite imageries; image processing and interpretation.

2. Spatial Data and Spatial Information System [10]

- Map projections and projected coordinate systems; vector and raster data format; topology; spatial data acquisition and analysis (buffer analysis, network analysis, spatial overlay, watershed analysis, terrain analysis, etc.); presentation of outcomes of spatial analysis; importance of GIS and web GIS, different fields of application of GIS and web GIS; E-R model; relational data model; spatial database management system (SDBMS); standard query language (SQL) for spatial databases

3. Geodesy, GNSS and Adjustment of Observations [12]

- Reference systems: astronomical, geocentric, geodetic and plane coordinate systems; ICRF, ITRF, ECEF, WGS84, Everest 1830; transformation between different reference systems; time systems; measurement of gravity potential; terrestrial, astronomical and satellite positioning; GNSS observables and mathematical models for positioning; satellite orbits; GNSS system biases and mitigation measures; satellite geometry and dilution of precision (DoP); GNSS survey techniques; field survey specifications; integration of INS in GNSS; augmentation systems; redundant observations, error

eclipse and confidence level; linear and non-linear adjustment models; least square adjustment method; statistical testing (univariate and multivariate).

4. Cartography and spatial visualization [6]

- Elements of map; types of map; principles and planning of map design; map design procedure; map layout; color scheme; typographic guidelines; map production and dissemination techniques; application of GIS in map design; static, dynamic, animated, interactive and collaborative web mapping and OGC standards.

5. Cadastre, and Land Administration and Management [10]

- Concept and types of cadastre; importance of cadastral system; analog vs digital cadastral system; different components of cadastre and technical requirements for cadastral survey in Nepalese context; different methods of cadastral survey including workflow; land registration process, updating and archiving of cadastral documents in Nepal; legal framework for cadastral system; international practices in cadastre; different components and advantages of LIS; stakeholders and their role in LIS; maintenance of cadastre and LIS in Nepal; national land policy; land market, taxation, reform and land use planning; land tenure and tenure security; issues of land management; land conflict and its resolution; modernization of land administration and management in Nepal.

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 2,000/- per credit)

Student must submit the examination form in each semester with necessary examination fee before completion of his/her Master's Degree. If any student is not being able to submit the examination fee for any semester, he/she will not be allowed to enroll for next semester.

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	4-8 Credits			12-16
II/I		0-8 Credits	4 Credits		4-12
II/II	24 Credits	16 Credits	4 Credits	16 Credits	60 Credits

4.2.2 Provision for Open Elective

Any student can take a maximum of 8 credits of open elective courses offered by the other master programs of the same department or other departments.

4.2.3 Instruction 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 considerable self-learning efforts should be applied by the students. Innovative approaches and ideas are also encouraged.

The evaluation is based on the internal evaluation (40%) and the final examination (60%). 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:

$$\text{Total percentage} = \frac{\sum(\text{credit} * \text{marks obtained})}{\sum \text{Credits}}$$

The marks percentage and division awarded will be as:

Percentage	Division
75 % or Above	Distinction
65<75	First
50<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 proceed 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 for registration of thesis but have to pass all the courses including elective courses before thesis 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. It is the responsibility of the students to manage the resources for their thesis work.

Normally, a student is expected to complete the course including final thesis defense within two academic years from the date of registration. If a student is not able to complete within two years he/she has to register for additional semester for completion of thesis. She/he may apply for the extension to the maximum of one semester with the approval of supervisor without getting admission. At any condition if all coursework including thesis defense is not completed within two and half academic years from the date of registration the corresponding student should register for each additional semester by paying the registration fee of Rs 20,000/- per semester.

After successful registration of thesis a student must submit the examination form in each semester with necessary examination fee before completion of his/her thesis.

द्रष्टव्य : प्रतिलिपि प्रमाणित गर्ने ब्यबस्था क्याम्पसले गर्ने छैन । आधिकारिक ब्यक्तिबाट प्रमाणित गराउने जिम्मेवारी आवेदक स्वयमको हुनेछ ।

**यस पुस्तिकामा उल्लेखित ब्यबस्था सम्बन्धित अख्तियारवालाले परिवर्तन गर्न सक्नेछ ।
यस प्रकार भएको परिवर्तन गर्नका लागि यस पुस्तिकामा छापिएको कुरा बन्देजको रुपमा
मानिने छैन । यस पुस्तिकामा प्रकाशित भएको कुनै ब्यबस्था नियमसँग बाझिन गएमा
बाझिएको हदसम्म यो ब्यबस्था लागु हुने छैन ।**

यस पुस्तिकामा उल्लेखित भएका कुनैपनि प्रावधानको अन्तिम ब्याख्या गर्ने सम्पूर्ण अधिकार
इ. अ. सं. मा निहित हुनेछ ।