



Tribhuvan University
Institute of Engineering
Entrance Examination Board



Information Brochure
on
Entrance Examination and Admission Procedure
for
M.Sc. Programs under IOE

Ashwin, 2072 BS

Tribhuvan University
Institute of Engineering
Entrance Examination Board

Detailed Schedule for Entrance Examination of Masters Programs – 2072

Time and Date for Online Application:

From 10 AM, 8th Kartik 2072 (25th October 2015)
To 5 PM, 15th Kartik 2072 (1st November 2015)

Admit card can be downloaded from: Kartik 19-21, 2072 from website:

<http://entrance.ioe.edu.np> or <http://www.ioe.edu.np>

Entrance Examination at ICTC, IOE, Pulchowk:

22-24 Kartik 2072 (November 8-10, 2015)

Publication of Result : 25th of Kartik 2072 (11th November 2015)

Admission Notice for the successful candidates shall be published by the Admission Committees of Constituent Campuses of IOE. The Academic session starts from 10th Mangsir 2072 (26th November 2015)

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-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 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. The Architecture Technician program was started by the IOE in its own effort. As first Bachelor's Degree level course in Engineering in Nepal, B. E. Civil Engineering was started in 1984. 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 and Electrical engineering and, in 1995 Mechanical engineering and Architecture were started in the Pulchowk Campus. From academic year 1998/99 IOE has started Bachelor's Degree program in Computer Engineering.

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 and 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 Master Programs' intake capacity is given in section 1.3 below. 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, an additional master program – 'Energy for Sustainable Social Development'- will be started at Central Campus Pulchowk. Similarly, new master programs in Electrical Engineering in Distributed Generation, Civil Engineering in Infrastructure Engineering and Management, and Master program in Computer Engineering, will be started at Paschimanchal Campus Pokhara, under IOE from the academic year 2072 BS.

1.3 Intake Capacities in Master Programs

The category-wise current intake capacities of each Master Programs are given below.

Campus	Master Programs	Regular		Full Fee / Sponsored		Total
		Regular Merit ¹	IOE Reserved ²	Full Fee ¹	Sponsored ³	
Central Campus Pulchowk	Urban Planning	5	1	6	8	20
	Information & Communication Engineering	5	1	6	8	20
	Structural Engineering	5	1	6	8	20
	Power System Engineering	5	1	6	8	20
	Renewable Energy Engineering	5	1	6	8	20
	Water Resources Engineering	5	1	6	8	20
	Geo-Technical Engineering	5	1	6	8	20
	Transportation Engineering	5	1	6	8	20
	Disaster Risk Management	5	1	6	8	20
	Computer System and Knowledge Engineering	5	1	6	8	20
	Energy System Planning and Management	5	1	6	2	20
	Environmental Engineering	5	1	6	8	20
	M.sc in Construction Management	5	1	6	8	20
	Technology and Innovation Management	5	1	4	6	16
	Climate change and Development	5	1	6	8	20
	Material Science	5	1	6	8	20
Energy for Sustainable Social Development (New)	5	1	4	6	16	
Thapathali Campus Kathmandu	Earthquake Engineering	5	1	6	8	20
Paschimnchal Campus Pokhara	Infrastructure Engineering and Management (New)	5	1	6	8	20
	M.Sc in Computer Engineering (New)	5	1	6	8	20
	Electrical Engineering in Distributed Generation (New)	5	1	6	8	20

- 1 seat in regular category and 1 seat in full fee category are reserved for female candidates in each program
- 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.
- Priority for the sponsored quota will be as follows:
 - 1st Priority: Candidates from government offices
 - 2nd Priority: Organizations having government share
 - 3rd Priority: INGO/NGO
 - 4th Priority: Private Organization
- Foreign students are considered only for full fee on merit basis and they should be admitted as self sponsored. seat is reserved for IOE faculty and 2 seats are reserved for female candidates.
- If applications are not received in sponsored category, then the seat will be fulfilled as full fee category.

2. ENTRY REQUIREMENT, APPLICATION 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 given below:

SN	Programs	Eligibility Requirements	
		Entrance stream	Pre requisite degree
1.	Urban Planning	PA	B.Arch./B.E (Civil) M.A.(Geography) 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	EC/EE/CA/MI/AS/PA	B.Arch/BE in any field
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	PA/CA/EE/EC/MI	B.Arch/BE in any field
10.	Disaster Risk Management	Any	B.E in any field/BArch/ M.Sc Science/M.A/ Minimum 4 years formal education after 10+2(with 2 years work experience in Disaster Risk Management)
11.	Energy Systems Planning and Management	EC/EE/CA/MI/PA	BArch/B.E in any field
12.	Computer System and Knowledge Engineering	EC	B.E in computer engineering/B.E. in electronics and communication engineering/B.E in electrical and electronics engineering or equivalent
13.	Environmental Engineering	CA	B.E (Civil or Agriculture) or equivalent
14.	Construction Management	CA/PA	B.E (Civil or Agriculture) or equivalent
15.	Climate Change and Development	PA/CA/EE/EC/MI/AS	B.E in any field/ B.Sc. Agriculture/ B.Sc. Forestry/ B.Sc. Science(4 years)/or equivalent
16.	Material Science	PA/CA/EE/EC/MI/AS	B.E in any field/ B.Sc. Agriculture/ M.Sc. Science for 3 years bachelor degree/B.Sc. Science(4 years)/or equivalent
17.	Energy for Sustainable Social Development (New)	PA/CA/MI	B.Arch/BE in Civil, Mechanical, Industrial and Agriculture Engineering or equivalent
18.	Earthquake Engineering	CA	B.E (Civil) or equivalent
19.	Infrastructure Planning and Development (New)	CA	B.E (Civil) or equivalent
20.	M.Sc in Computer Engineering (New)	EC	B.E in Computer engineering/B.E in Electronics and communications/B.E in Electrical and Electronics Engineering/ or equivalent
21.	Electrical Engineering in Distributed Generation (New)	EE	B.E Electrical or Equivalent

- Have undergraduate grades significantly above average and not less than the 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 Board of IOE (or as recommended by special entrance committee for Foreign students)
- **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 Application Process

2.2.1 Online Application

The candidate willing to appear in the entrance examination to get enrollment into the program should fill and submit the online form within the deadline prescribed by the Entrance Exam Board. Application forms will be available in the websites: <http://www.ioe.edu.np> or <http://entrance.ioe.edu.np> of IOE. 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 using a specially prepared voucher by filling applicant's name and date of birth. 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 the color photograph of prescribed specification and also upload the 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 can contact ICTC, Pulchowk, and apply for correction by filling a correction form with a charge of Rs. 150.

2.2.2 Provision of Admit Cards

Admit card can be downloaded from: 19th Kartik 2072 (5th November,2015) onwards from the websites: <http://www.ioe.edu.np> or <http://entrance.ioe.edu.np> of IOE. Applicants should bear the admit card and the mentioned identification document during the entrance examination. Without admit card applicant will not be allowed to appear in the entrance examination.

2.2.3 Mode of Entrance Examination

The candidate should appear in one of the following stream of entrance examination to get the admission in any Master Program at IOE.

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	Disaster and Planning	DP

- Entrance examination will be of Computer Based Multiple Choice Type - of 2 hours duration consisting of two sections. **Section- A** is common to all streams, consisting of 45 questions

of 50 marks. While **Section-B** consists of stream specialized course with 50 nos. of questions of 1 mark each.

- The Candidates have to secure minimum marks as prescribed by the Faculty Board of IOE in both sections separately.
- All questions will be in English.
- **There will be no negative marking for wrong answer.**
- Non programmable calculators are permitted. Exchange of calculators is strictly prohibited. Candidates have to bring their own calculators.

2.2.4 Selection Process

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

- Candidates fulfilling the program entry requirements will be selected for the admission on the basis of merit list based on the normalized score of the Entrance examination.
- T.U. recognized AMIE candidates thus selected on the basis of merit list based on the score of entrance examination shall, however, be offered provisional admission for the following academic years. Such candidates after passing the prerequisite courses specified by IOE will have to join the respective program within two academic years.
- Admission committees of respective Campuses will publish the first list of admission as per its schedule. The candidates should contact to 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 second list.

2.2.5 Admission

- The successful candidates should pay required fees 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.
 - Original copies of migration and provisional certificates, if applicable.
 - Original copy of Nepali citizenship certificate/ Passport for foreign students
 - Certificate of completion or prerequisite courses with pass marks for TU recognized AMIE candidates.
- In case of discrepancy on verification of the original certificates, or in case of inclusion of the candidate's name in the admission list by mistake of any kind, admission of such a candidate will be cancelled even after his /her formal admission.
- Candidates waiting for the final semester result shall be admitted provisionally till the commencement of the semester. Seats occupied by the candidates failing to furnish the pass

certificates of all exams within the stipulated time frame shall be considered as vacant and fulfilled by the campus admission committee as per the IOE rule.

Note:

1. Admission of the candidates to the program not fulfilling the enrollment to the full fee category may be suspended and the amount paid by the candidate in the admission process shall be refunded to the candidate.
2. In any program if 60% of the full fee and sponsored seats are not fulfilled within admission deadline, that program may be suspended and the amount paid by the candidate in the admission process shall be refunded.
3. *Candidates applying for admission at Mechanical Department have to appear in separate aptitude tests conducted by the respective campus. Final selection will be made on the basis of 70% weightage of entrance score and 30% weightage of aptitude test score.*

2.2.6. Fee Structure

Fees arrangement for Masters program will be as follows:

	Regular	Full fee	Sponsored	Scholarship	
Tuition fee (Per Semester)	12,180.00	37,680.00	1,35,000.00	10,180.00	
Deposit (Refundable)					
Campus Deposit	3,000.00	3,000.00			
Lab Deposit	1,000.00	1,000.00			
Library Deposit	1,000.00	1,000.00			
Deposit (Non refundable)					
Campus development Fund	2,000.00	2,000.00	2000.00		
Maintenance Fund	2,000.00	2,000.00			
ID Card Fee	175.00	175.00	175.00		175.00
At the time of Admission	21,355.00	46,855.00	542175.00		10,355.00
TU Registration fee Rs 300.00 (Rs 600 for the students passing B E or equivalent from abroad)					

The candidates should pay extra charge for Internet access separately during admission as per the college rule. The given fee structure is for completing the minimum specified courses within two 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 regulation.

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.

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

- a. 10% deduction from tuition fees prior to the start of class.
- b. 20% deduction from tuition fees till 7th day after the start of class.
- c. No repayment of tuition fees and non refundable deposits following the 7th day from the commencement of the class.

2.2.7. 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.

3. CURRICULUM FOR M.Sc. ENTRANCE EXAMINATION

The Entrance examination for the academic year 2072/073 will be “Computer Based Examination” of two hours duration, consisting of two sections.

Section- A is common to all streams, consisting of 45 questions of 50 marks. While **Section-B** Consists of stream specialized course with 50 nos. of questions of 1 mark each. Each question will be of objective type with multiple choice answers.

SECTION-A

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

1. Critical Reasoning

[5 × 2]

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

The Critical reasoning section measures your ability to:

- analyze and evaluate written material and synthesize information obtained from it.
- analyze relationships among component parts of sentences.

2. Mathematics

[40 × 1]

The format of these multiple-choice questions varies. The solution may require simple Computations, manipulations or multi-step problem-solving.

These sections aim to test the candidate's understanding of Basic Mathematics (Numbers: operations; Fractions, Decimals and Percentages; Ratio and Proportion; Roots and Power; Logarithms; Progressions; Elementary Geometry and Mensuration; Elementary Trigonometry; Introductory Set Theory) Algebra (Polynomials, Equations and Inequalities; Simultaneous equations and solutions; Elementary Linear Programming); Calculus (limits and continuity, differentiation, integration, ordinary linear differential equation, partial differential equation), Probability and Statistics (Counting, Permutations and Combinations).

SECTION-B

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

Planning and Architecture [50 × 1]

1. Planning [35]

1.1. Urbanization in Nepal

1.2. Historical Development and present state

1.3. Problems of Urbanization in towns of Nepal

1.4. Urban Services: Transportation, Water Supply, Sewerage, electricity

1.5. Urban environment

1.6. Municipalities and their programmes to tide over the problems.

1.7. Public/community participations in planning.

2. Architecture: [15]

2.1. History of Architecture -Western, Eastern, Nepalese & contemporary

2.2. Architectural Conservation

2.3. Building environment – sustainable architecture, climatology etc.

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

1. Structural Engineering [10]

Stress and strain, Bending and deflection and its equations, Statically determine structure: displacements by energy principles; static and kinematic indeterminacies; analysis of indeterminate structures; slope-deflection and moment-distribution methods; influence lines for determinate and indeterminate structures; trusses; two and three hinged arches; analysis of trusses and frames; concepts of plastic analysis of beams.

2. Geo-technical Engineering [10]

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

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

3. Water Resources Engineering [10]

Physical properties, Fluid pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Euler's equation, Bernoulli's equation, Navier stokes equation Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump and its

analysis, Similitude and physical modeling, Physical hydrology, Surface runoff, Rainfall-runoff correlation, Hydrograph Analysis, Unit hydrographs, Peak flow estimation.

4. Transportation Engineering

[10]

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

5. Water Supply & Sanitary Engineering

[10]

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

Electrical Engineering (EE)

[50 ×1]

1. Basic Electrical Circuits

(10)

- Circuit fundamentals: Series & parallel circuits, circuit elements, independent & dependent sources, Ohms law, Krichoff's Voltage & Current Laws
- Network Theorems: Thevenin's, Nortan's, Maximum power & Reciprocity Theorems
- AC circuits: Concept of complex impedance, 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 circuits. Pole zero plots
- Two port Networks: Z -parameters, Y-parameters & ABCD-parameters

2. Electrical Machines

(10)

- Electromagnets: Magnetic circuits, Fleming's Right hand & Left hand rules, Farady's Law of electromagnetic induction, electromechanical energy conversion principle
- Transformers: Equivalent circuits, Phasor diagrams, Losses & efficiency, Voltage regulations, Instrument transformers, three phase transformer connections, parallel operation of 1-1 & 3-1 Transformers
- Synchronous m/c: Operating principle, Effect of excitation, Power angle characteristic, Phasor diagrams, Losses & efficiency, Voltage regulations, parallel operation of alternator

- Induction machine: Operating principle, T-S Characteristics, Losses and efficiency, Testing, Starting methods, Speed control
- DC generator: Construction, Operating principle and characteristics of different types dc generator
- DC motor: Operating principle, Characteristics of different types dc motor, Speed control and starter

3. Power Systems

(20)

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

4. Basics Electronics

(10)

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

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

1. A. Electrical Circuit and System [5]

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

2. Electronics Circuit and System [10]

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

3. Computer Architecture [15]

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

4. Communication System [4]

- Analog and Digital Communication Theory and System

5. Object Oriented Programming Languages [8]

- Object oriented programming concepts
- Introduction to C++

- Operator Overloading
- Encapsulation
- Polymorphism
- Inheritance
- Templates and file handling

6. Discrete Structure

[8]

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

Mechanical & Industrial Engineering (MI)

[50 ×1]

1. Thermodynamics and Heat Transfer

[12]

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

2. Fluid Mechanics and Fluid Machine

[10]

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

3. Mechanics and Strength of Materials

[12]

- Concept of particles and rigid bodies
- Effect of forces on particles and rigid body

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

4. Energy

[8]

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

5. Industrial Engineering and Management

[8]

- Classification of manufacturing processes.
- Materials selection criteria.
- Elements of cost.
- Role of production, operation management and system concepts
- Production planning and control
- Plant location and plant layout design
- Forecasting techniques
- Inventory Control
- Decision making process
- Quality Assurance and Quality Control

Applied Science (AS) [50 ×1]

1. Waves and Oscillation [5]

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

2. Electricity and Magnetism: [5]

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

3. Heat and Thermodynamics: [4]

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

4. Optics: [4]

Interference, diffraction, polarization, optical fibers

5. Modern Physics: [7]

Photoelectric effect, Quantization of energy, Lasers, Fission, Fusion

Energy and Environment: Renewable and Non Renewable Energy Resources, Ultraviolet radiation, greenhouse effect, climate change

6. Water: [3]

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

7. Pollution: [4]

Water pollution: Surface and ground water, water pollutants- visible, invisible: chemical and microbiological, their adverse effect and remedies, Air Pollution; Air pollutants, SO_x, NO_x, CO_x, O₃, hydrocarbons, particulates- dust, smoke and fly ash

8. Electrochemistry: [3]

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

9. Catalysts: [1]

Action of catalysts, characteristics and mechanism of catalysis,

10. Transition metals: [2]

Electronic configuration, properties and their applications

- 11. Polymers:** [2]
Organic and Inorganic polymers, bio-degradable and non bio-degradable, conducting polymers
- 12. Fuel and combustion:** [2]
Classification, calorific values, coal, petroleum, kerosene, gasoline, biogas
- 13. Explosives:** [2]
Classification, preparation and application
- 14. Instrumental technique in chemical analysis:** [2]
Visible and ultraviolet spectroscopy, Nuclear Magnetic Resonance (NMR), atomic absorption spectrometry (AAS)
- 15. Isomerism:** [1]
Stereoisomerism-geometrical, optical
- 16. Chemistry in daily life:** [3]
Carbohydrates, proteins, enzymes, nucleic acids, drugs and their classification- antacids, antihistamines, neurologically active drugs- tranquilizers, analgesics, antimicrobials- antibiotics, antiseptics and disinfectants, soaps and detergents

Disaster and Planning (DP) [50 ×1]

- Hazards, disaster & Risk [5]
- Disaster scenario in Nepal [10]
- Historical accounts of different disasters in the country [10]
- Different hazards; Earthquake, flood, landslide, fire, epidemics [15]
- Municipalities/VDCs and their response to disasters [5]
- Disaster Risk Management approaches adopted in Nepal in recent times [5]

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. Internal Evaluation

Internal evaluation is carried out by two internal assessments and assignment.

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 defend within the regular 4th semester should take admission for the next semester and should defend as per Academic Calendar of IOE. He/She may apply for the extension for the maximum of one semester with the approval of supervisor without getting admission.

Note: It is the responsibility of the students to manage the resources for their thesis work.