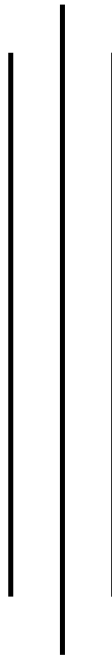Tribhuvan University
Institute of Engineering
# Entrance Examination Board

Information Brochure
on
Entrance Examination and Admission
for
M.Sc. Programs at Pulchowk Campus


2070

<div align="center">

Tribhuvan University
Institute of Engineering
# Entrance Examination Board

</div>

Detailed Schedule for Entrance Examination of Masters Programs – 2070


Time and Date for Online Application:

: From 10 AM, 11$^{th}$ Aswin 2070 (27$^{th}$ September 2013)

To 5 PM, 20$^{th}$ Aswin 2070 (6$^{th}$ October 2013)


Admit card can be downloaded from:  6th Kartik 2070 onwards from website:

**http://entrance.ioe.edu.np or www.ioe.edu.np**


Entrance Examination at Central Campus, Pulchowk

: From 11:00 AM to 2:00 PM, 9$^{th}$ Kartik 2070 (26$^{th}$ October 2013)


**Publication of Result** **:** 15$^{th}$ of Kartik 2070 (1$^{st}$ November 2013)


**Notice for the Admission shall be published by Central Campus, Pulchowk Admission Committee. The Academic session starts from 2$^{nd}$ Mangsir 2070 (17$^{th}$ November 2013)**

# 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. With the assistance of the World Bank and UK, later, the existing technician level courses were strengthened and Bachelor's Degree level course in Civil Engineering was started. Similarly, with the assistance of the World Bank, the Swiss Government, and the Canadian Government, Bachelor Degree level courses in the Electronics, Electrical engineering were started in 1994 and Mechanical engineering and Architecture were started in 1995 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) Pulchowk Campus

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 below in section 1.3 below. Institute has also started regular Ph D admission from academic session 2010/11 in all departments.

## 1.3 Intake Capacities in Master Programs

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

| Program | Regular | | Full Fee / Sponsored | | | |
|---|---|---|---|---|---|---|
| | Regular Merit* | IOE Reserved+ | Full Fee* | Sponsored++ | Scholarship | Total |
| 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 | 6** | 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 |

\*    1 seat in regular category and 1 seat in full fee category are reserved for female candidates in each program (except Technology and Innovation Management)

\*\*    Applicable only if project support is available and 50 % seat is reserved for female candidates

\+    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 Regular 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.
^    1 seat is reserved for IOE faculty and 2 seats are reserved for female candidates.

−    If applications are not received 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/CA | B.Arch./BE (Civil) M.A.(Geography) or equivalent |
| 2. | Information & Communication Engineering | EC/EE | BE (Electronics/Electrical/Computer) or Equivalent |
| 3. | Structural Engineering | CA | BE (Civil) or equivalent |
| 4. | Power System Engineering | EE | BE (Electrical) or equivalent |
| 5. | Renewable Energy Engineering | EC/EE/CA/MI/ AS/PA | B.Arch/BE in any field |
| 6. | Water Resources Engineering | CA | BE (Civil or Agriculture) or equivalent |
| 7. | Geo-Technical Engineering | CA | BE (Civil) or equivalent. |
| 8. | Transportation Engineering | CA | BE (Civil) or Equivalent |
| 9. | Technology and Innovation Management | PA/CA/EE/EC/ MI | B.Arch/BE in any field |
| 10. | Disaster Risk Management | Any | BE/BArch and M.Sc or MA or Minimum 4 years formal education after 10+2(Except BE/ BArch 2 years work experience in Disaster Risk Management), Civil, Agriculture |
| 11. | Energy System Planning and Management | EC/EE/CA/MI/ PA | BArch/BE in any field |
| 12. | Computer System and Knowledge Engineering | EC | Bachelors degree in computer/electronics and communication engineering, electrical and electronics engineering or its equivalent from recognized institutions |
| 13. | Environmental Engineering | CA | BE (Civil or Agriculture) or equivalent |
| 14. | Construction Management | CA/PA | BE (Civil or Agriculture) or equivalent |
| 15. | Climate Change and Development | PA/CA/EE/EC/ MI/AS | 4 Years Bachelors in engineering/Agriculture/Forestry/Science |
| 16. | Material Science | PA/CA/EE/EC/ MI/AS | 4 Years Bachelor Engineering/Science or M.Sc. in Science who have completed 3 years bachelor degree |

- 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 procedure are as follows :

(1) The candidate should deposit an amount of Rs.2000/- as an application fee for entrance examination in Account No. 00915056064 of the Siddhartha Bank Limited using a specially prepared voucher by filling applicants name and date of birth. The voucher number indicated in voucher need 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 document.
   - Citizenship certificate.
   - Passport.
   - Last exam admit card.

If any change has to done on the submitted information in application form, candidates can contact CIT, Pulchowk Campus, 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: 6th Kartik 2070 onwards from website: http://entrance.ioe.edu.np. 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 the entrance examination.

### 2.2.3. Mode of Entrance Examination
The candidate should appear in one of the following streams of entrance examination to get the admission in a Masters 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 a single paper of 3 hours duration consisting of two sections. Section- A is common to all streams, consisting of 50 questions of 60 marks. While Section-B consists of stream specialized course with 60 nos. of questions of 1 mark each.
- The Candidates has to secure minimum marks as prescribed by the Faculty Board of IOE in both sections separately.
- The question papers will be in English.
- The separate answer sheet is provided with the question paper which must be used for answering the questions.
- 25% negative marks for wrong answer.
- Non programmable calculators are permitted. Exchange of calculators is strictly prohibited. Candidates have to bring their own calculators.
- The result of entrance examination will be published in normalized parentage and rank stream wise. The normalized percentage will be calculated as per the following formulae.

$$\left[ Marks\,A + \left\{ MTH + \frac{MO - MTH}{MXS - MTH} \times (60 - MTH) \right\} \right] \times \frac{1}{1.2}$$

where
MO: Marks Obtained in section B
MXS: Maximum marks obtain by the candidate in section-B of that stream
MTH: Threshold marks in section- B
Marks A : Marks Obtained in section A

### 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 Pulchowk campus 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 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 committee of Pulchowk Campus 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 stipulated time will be filled by waiting 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 Pulchowk Campus. Candidates failing to do so will loose 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 passed 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:** *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 admission process shall be refunded to the candidate.*

### 2.2.6. Fee Structure

Fees arrangement for Masters Program will be as follows:

|  | Regular | Full Fee | Sponsored | Scholarship |
|---|---|---|---|---|
| Tuition Fee (Per Semester) | 12180.00 | 37680.00 | 85680.00 | 10180.00 |
| Deposit (Refundable) |  |  |  |  |
| Campus Deposit | 3000.00 | 3000.00 |  |  |
| Lab Deposit | 1000.00 | 1000.00 |  |  |
| Library Deposit | 1000.00 | 1000.00 |  |  |
| Deposit (Refundable) |  |  |  |  |
| Campus Development Fund | 2000.00 | 2000.00 |  |  |
| Maintenance Fund | 2000.00 | 2000.00 |  |  |

| | | | | |
|---|---|---|---|---|
| ID Card Fee | 175.00 | 175.00 | 175.00 | 175.00 |
| At the time of Admission | 21355.00 | 46855.00 | 342895.00 | 10355.00 |

**TU Registration Fee** *Rs. 300.00 (Rs. 600 for the students passing BE or equivalent from abroad.)*

In addition to the above fees, candidates have to pay Rs. 300 (Rs. 600 for the students passing BE or equivalent from abroad.) as a TU registration fee_. 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.

**Candidate under the scholarship category have to pay total amount of 10355.00 at the time of Admission. The candidate under sponsor category have to pay the fee for full course duration (2Yrs.) 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. Cash transaction shall not be entertained.**

In case, the admitted student need 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 seventh day after the start of class.
c) No. repayment of tuition fees and non-refundable deposit following the seventh 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 ENTRANCE EXAMINATION

Entrance examination will be of a single paper of 3 hours duration consisting of two sections. Section- A is common to all streams, consisting of 50 questions of 60 marks. While Section-B consists of stream specialized course with 60 nos. of questions of 1 mark each.

### SECTION-A

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

**1. Critical Reasoning** [5 × 3]

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 questios measure your ability to read with understanding, insight and discrimination. These questions explore your ability to analyze a written passage from several perpectives, 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** [45 × 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 Mensuratio; Elementary Trigonometry; Introductory Set Theory) Algebra (Polyomials, 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** [60 × 1]

1. **Planning** [40]
   **1.1. Urbanization in Nepal [5]**
   **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 etc**
   **1.5. Urban environment**
   **1.6. Municipalities and their programmes to tide over the problems .**
   **1.7. Public/community participations in planning.**
2. **Architecture:** [20]
   **2.1. History of Architecture-Western, Eastern, Nepalese & contemporary architecture**
   **2.2. Architectural Conservation**
   **2.3. Building environment –sutainable architecture, climatology etc.**

**Civil & Agricultural Engineering (CA)** [60 × 1]

1. **Structural Engineering** [12]

   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** [12]

   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** [12]

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** [12]

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** [12]

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)** [60 ×1]

1. **Basic Electrical Circuits** (12)

| | |
|---|---|
| • 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** (12)

| | |
|---|---|
| • 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-N & 3-N 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 (24)

- 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 schocks, Equipment Earthing

## 4. Basics Electronics (12)

- 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) [60 × 1]

1. A. Electrical Circuit and System [5]

- Ohms law, Kirchoff's laws
- Thevenin'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 [20]

- 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 [5]

- Analog and Digital Communication Theory and System

5. Object Oriented Programming Languages [10]

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

6. Discrete Structure [10]

- 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)** [60 ×1]

1. Thermodynamics and Heat Transfer [14]

- 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 [14]

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

3. Mechanics and Strength of Materials [14]

- 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                                                                                                [10]

- 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)**                                                                            **[60 ×1]**

1. Waves and Oscillation:                                                                                [6]
   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:                                                                            [8]
   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:                                                                                       [8]
   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: [5]
Water pollution: Surface and ground water, water pollutants- visible, invisible: chemical and microbiological, their adverse effect and remedies, Air Pollution; Air pollutants, $SO_x$, $NO_x$, $CO_x$, $O_3$, hydrocarbons, particulates- dust, smoke and fly ash

8. Electrochemistry: [4]
Electrode potential and its measurement, standard electrode potential, electrochemical cells, electrolytic cells, Ners't 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: [3]
Organic and Inorganic polymers, bio-degradable and non bio-degradable, inducting polymers

12. Fuel and combustion: [2]
Classification, calorific values, coal, petroleum, kerosene, gasoline, biogas

13. Explosives: [2]
Classification, preparation and application

14. Instrumental technique in chemical analysis: [2]
Visible and ultraviolet spectroscopy, Nuclear Magnetic Resonance (NMR), atomic absorption spectrometry (AAS)

15. Isomerism: [2]
Stereoisomerism-geometrical, optical

16. Chemistry in daily life: [4]
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)**                                    **[60 ×1]**

- Hazards, disaster & Risk [5]
- Disaster scenario in Nepal [10]
- Historical accounts of different disasters in the country [15]
- Different hazards; Earthquake, flood, landslide, fire, epidemics [20]
- 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 defense 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.*