TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS
DEPARTMENT OF CIVIL ENGINEERING

Our Ref:

Date.....
2073/02/24

Dear Sir,
As per your letter dated 2073-02-12 (ref no 373), I am sending the information as stated below:

1. Name of the Program: **Master of Science (M.Sc.) in Structural Engineering**
2. Admission Requirements: **BE (Civil) or equivalent**
3. Intake Capacity: **20** (Regular Merit*=5; IOE Reserved =1; Full Fee* = 6; Sponsored = 8)
4. Curriculum and coarse structure: **Attached here**
5. Facilities: **Structural engineering laboratory**

With best regards.

Bharat Mandal
Program coordinator
M. Sc. In Structural Engineering

Ananda Niketan, Pulchowk, Lalitpur, Nepal. G. P. O. Box 1175, Kathmandu, Tel : 5521260 Ext. 408, 403
Telephone : 5525477, 5543070 Fax : 977-1-5525477 E-mail : civil_dept@ioe.edu.np URL : http//civil.ioe.edu.np

M Sc Engineering
in
Structure

Year : I

Part : I

S. N.	Course Code	Course Title	Credit	Examination Scheme				Total	Remark
				Theory					
				Assesment Marks	Final				
					Duaration hours	Marks			
1	CE 801	Introduction to Solid Mechanics	4	40	3	60		100	
2	CE 802	Advanced Structural Analysis	4	40	3	60		100	
3	CE 803	Structural Dynamics	4	40	3	60		100	
4	CE 804	Concrete Technology and Design	4	40	3	60		100	
5	CE 805	(Elective-I	4	40	3	60		100	
			20	200	15	300		500	

Elective I

Computer Aided Design)
Construction Methods & Management(Elective- I)

Year : I

Part : II

S. N.	Course Code	Course Title	Credit	Examination Scheme				Total	Remark
				Theory					
				Assesment Marks	Final				
					Duaration hours	Marks			
1	CE 851	Design of Foundation	4	40	3	60		100	
2	CE 852	Seismic Resistant Design of Structures	4	40	3	60		100	
3	CE 853	Structural Engineering Laboratory	4	40	3	60		100	
4	CE 854	Elective II Design of Industrial Structures	4	40	3	60		100	
5	CE 855	Elective III Introduction to Theory of Shells	4	40	3	60		100	
		Application of Finite Element method in Structural Engineering.	20	200	15	300		500	

Eletive II

Eletive III

M Sc Engineering
in
Structure

Year : II

Part : I

S. N.	Course Code	Course Title	Credit	Examination Scheme			Total	Remark
				Theory				
				Assesment Marks	Final Duaration hours	Final Marks		
1	CE 902	Elective IV	4	40	3	60	100	
2	CE 901		4	40	3	60	100	
3			4	100			100	
		Total	12	180	6	120	300	

Elettive IV

Year : II

Part : II

S. N.	Course Code	Course Title	Credit	Examination Scheme			Total	Remark
				Theory				
				Assesment Marks	Final Duaration hours	Final Marks		
1	CE 951	Thesis Work	16	100				
		Total	16	100	0	0	0	

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

CURRICULUM

MASTER OF SCIENCE IN STRUCTURAL ENGINEERING

1996 Estd.

FOREWORD

The Institute of Engineering, under its plans to embark on higher level of Engineering Education, is introducing Master Level Programme in various field of Engineering. Master of Science in Structural Engineering is one of such programme started from December, 1996 at Pulchowk Campus.

The need to adopt the recent technological development and to initiate research and development activities to better cope with the structural engineering problems in the country necessiated the M.Sc. programme. The programme will facilitate the process of in-country upgrading of the engineers.

The curriculum of this programme is an outcome of numerous discussions held during various meetings of the specialists, recommendation of the Civil Engineering Subject Committee and the approval of the Faculty Board. Many members of the faculty and in particular, Core Group on Structural Engineering have contributed extensively in preparation of this curriculum. The professional assistance accorded by the faculty of IIT Delhi also is highly appreciated.

The contribution of the Norwegian National Committee for Development Research and Education (NUFU) through the Norwegian University for Science and Technology (NTNU), Trondheim, Norway in introduction of the programme is noted with a deep gratitude. The Centre for Applied Research and Development (CARD) is commended for its continuous support.

Dean's Office
Institute of Engineering
Pulchowk, Lalitpur, Nepal

Date : January 15, 1997

Dr. Rajendra Dhoj Joshi
Dean
Institute of Engineering

CONTENTS

1. INTRODUCTION

The Master of Science (M.Sc.) program in Structural Engineering is offered by the Department of Civil Engineering at Pulchowk Campus of the Institute of Engineering, Tribhuvan University. The details of the program are as follows :

1.1 Title of the Program : Master of Science (M.Sc.) in Structural Engineering.

1.2 Objective of the Program : To train engineers in technical and analytical skills of structural engineering with latest methods of structural analysis and design, advanced design and material technology. The graduates of the program will be able to

i. carry out higher studies and research;

ii. practice as a professional structural engineer in design and construction areas.

1.3 Duration of the Course : The minimum period of full time attendance required for the degree of M.Sc. in Structural Engineering is 2 years. The maximum period within which a student is allowed to complete the course is 3 years.

2. ADMISSION REQUIREMENTS

2.1 Program Entry Requirements : To be eligible for admission to the Programme, a candidate must hold a Bachelor Degree (Four - year regular) Programme in Civil Engineering from Tribhuvan University of its equivalent from an institution of recognized standing.

2.2 Selection : Candidates fulfilling the Program Entry Requirements will be selected for admission on the basi of merit, which will be assessed in terms of total marks consisting of :

(a) 40% weightage of the total aggregate of Bachelor of Civil Engineering, and

(b) 60% weightage of the marks secured in the Admission Test.

3. COURSE STRUCTURE AND REGISTRATION

3.1 Contents : The courses offered in the program are classified into two groups, namely, core courses an electives. Core courses are the ones which are fundamental in nature and which each student of the program mu learn. These courses provide essential knowledge or pre-requisite for taking up higher level courses in the area Structural Engineering. Elective courses allow the students to specifically train them in a particular direction, f example, in the direction of higher studies and research, or in the direction of practical designs or in the directic of construction and field activity.

In addition to the courses, each student has to undertake a project thesis of 16 credits. The project essential provides a research training to the student. The students will work on a specific topic under the guidance of supervisor. The students are encouraged to think independently, to do systematic review work, to develop comput software or to carry out laboratory experiments and present the outcome of the work in the form of a dissertati (thesis).

3.2 Credit System : The course curriculum is organized in the overall frame work of credit system. The promine features of the credit system are a process of continuous evaluation of a student's performance, and flexibility allow a student to progress at an optimum pace suited to his ability and convenience. Each course has a certa number of credits which describes its weightage. The number of credits depends upon the contact hours for t course and its work load. A course, in general, is designed for a 3 hr. lecture contact and 1 hr. tutorial (or assignm discussions) contact per week. This is denoted by a label (3-1-0) indicating '0' contact hr. for Laboratory. T courses having laboratory contacts will have levels like, 1-0-3 indicating 1 hr. lecture contact, 0 hr. tutorial cont and 3 hr. laboratory contact. Generally, a 3-1-0 Label Course is assigned a credit of 4.

3.3 Course Codes : Each course offered by the Institute is identified by two letters, EG, followed by three numerical digits and two letters. The first digit denotes the program and the year in which the course is normally taken. The first digit of 8 and 9 indicates the first and second year respectively of Master's level course. The second digit from 0 to 4 are used for courses offered in the first semester and 5 to 9 for the second semester. The third digit is used to identify the particular course. The last two letters denote the department which offers the course.

Example : EG 802 CE denotes the course 'Advanced Structural Analysis' which is offered in the first year first semester of M.Sc. program by the Department of Civil Engineering.

The Course offered are listed as follows :

A. CORE COURSES

EG 801 CE	Introduction to Solid Mechanics	4 Credits (3-1-0)
EG 802 CE	Advanced Structural Analysis	4 Credits (3-1-0)
EG 803 CE	Structural Dynamics	4 Credits (3-1-0)
EG 804 CE	Concrete Technology and Design	4 Credits (3-1-0)
EG 851 CE	Design of Foundation	4 Credits (3-1-0)
EG 852 CE	Seismic Resistant Design of Structures	4 Credits (3-1-0)
EG 853 CE	Structural Engineering Laboratory	4 Credits (1-0-3)

B. ELECTIVE COURSES

EG 805 CE	**Computer Aided Design**	**4 Credits (2-0-2**
EG 806 CE	**Construction Methods and Management**	**4 Credits (3-1-0**
EG 854 CE	**Design of Industrial Structures**	**4 Credits (3-1-0**
EG 855 CE	**Functional Planning and Building Services**	**4 Credits (3-1-0**
EG 856 CE	**Application of Finite Element Method (FEM) in Structural Engineering**	**4 Credits (3-1-0**
EG 901 CE	**Rock Slope Engineering**	**4 Credits (3-1-0**
EG 902 CE	**Design of Bridges**	**4 Credits (3-1-0**

List of electives may be modified by deleting or adding courses in the above list depending upon th technological needs, teaching facilities and expertise available.

C. RESEARCH PROJECT WORK (THESIS)

EG 903 CE	**Research Project in Structural Engineering (Thesis)**	**16 Credits**

3.4 Instructional Methods : Every course is co-ordinated by a member of the faculty of the Department whi offering the course in a given semester. This faculty member, called the Course Coordinator, has the responsibility for conducting the course, co-ordinating the work of the other members of the faculty involv that course, holding the tests and assignments, and awarding the marks. For any difficulty the student is encour to approach the Course Coordinator for advice and clarification. Apart from the lectures, through which the c is delivered, a certain number of assignments will be given in each course. Each assignment or a tutorial consists of a number of problems that covers a particular section of the course. The problems are set in su fashion that the student understands thoroughly the subject matters presented in the section after solving t Generally, 4 to 8 assignments are given in each course. Tutorial contact hours, allotted in a course, are utilize

assignment discussions and augmentation of lectures. Practical classes in the form of laboratory works or computations, are used to verify the concepts and to develop necessary technical and analytical skills. The program, in general, emphasizes on the process of self-learning.

3.5 Registration : Every student must register and seriously attempt to complete all the courses including project work in 2 years. In the first two semester, a total of 12 courses will be offered with 6 courses in each semester. Out of the 6 courses in a semester, 4 courses in the first and 3 courses in the second semester will be from the list of Core Courses; the rest will be floated from the list of elective courses. While Core Courses to be offered in each semester are fixed, the elective courses that will be offered in a semester may vary and depend upon the convenience of teaching, and other administrative factors.

A student should follow the following requirements:

(a) A student will normally be allowed to register for a minimum of 12 Credits and a maximum of 24 Credits per semester.

(b) A student shall successfully complete, as a minimum requirement, the Course Work of 12 Credits including atleast 2 Core Courses in I semester to be eligible to register for II semester.

(c) A student shall successfully complete, as a minimum requirement, the Course Work of 12 Credits including at least 2 Core Courses in II semester to be eligible to register for III semester.

(d) A student may register for Research Project Work (Thesis) in III semester only after successful completion of 24 Credits with atleast 4 Core Courses in the preceding semesters.

(e) If a student registers for the Research Project Work (Thesis) in III semester, he/she may register for a maximum of 12 Credits of Course Work but with not more than 2 Core Courses.

(f) If a student registers for the Research Project Work (Thesis) in IV semester, he/she may register for a maximum of 8 Credits of Course Work.

4. EVALUATION

4.1 Evaluation System : The evaluation of a student in any course will be based on his performance in 2 mir tests, a major test and assignments. A major test will be conducted at the end of the semester and will genera cover the contents of the entire course. Two minor tests will be conducted in between the semester, genera portions covered in the first minor test is not included in the second minor test. The relative weightages attached the major test, minor tests and assignments depend on the nature of the course, and the distribution of weighta will be decided by the Course Coordinator. However, in general a weightage of about 20% is attached to t assignment component of the evaluation, another 40% weightage is given to the minor tests and the rest 4(weightage is attached to the major test. Where a course does not have significant assignments, the scheme evaluation and relative weightage attached to each component may deviate from the general pattern as describ above, and are decided by the Course Coordinator.

A student shall secure a minimum marks in each course, as prescribed by the faculity board of the Institute Engineering to be declared as successful.

Each course will have a full mark of 100. The full mark for the Research Project Work (Thesis) is 400. Dependi upon the total percentage of the marks obtained, the following division will be awarded.

Percentage		Division
50 - < 65	-	II
65 - < 75	-	I
75 - higher	-	Distinction

4.2 Qualifying Criteria : To qualify for the degree of Master of Science in Structural Engineering, a student m satisfactorily complete a program of course work of 60 credits including an independent Research Project W (Thesis) of 16 credits.

COURSE DETAILS

A. CORE COURSES

EG 801 CE Introduction to Solid Mechanics 4 Credits (3-1-0)

Partial differential equations and integral equations, Fourier integral, Functional approximation; Theory of stress and strain, stress and strain tensor; Elastic constitutive equation: Stress - displacement functions: Principle of virtual work and its applications, plate bending theory; 3 p elasticity, element of plasticity.

EG 802 CE Advanced Structural Analysis 4 Credits (3-1-0)

Matrix method of structural analysis; Solution of linear systems; Finite Element Method of structural analysis (exposure to packages), variational principles - Galerkin Ritz and Kontorovitz methods; Substructuring technique; Non linear analysis, solution of non linear equations; Analysis of plates and shells of revolution : conventional and numerical methods; Stability Analysis.

EG 803 CE Structural Dynamics 4 Credits (3-1-0)

Free and forced vibration of single degree of freedom (SDOF) system, response to harmonic, periodic, impulsive, general dynamic loading and support motions; Free vibration of lumped multi-degree of freedom system - numerical methods for obtaining natural frequencies and mode shapes, normal mode theory. Frequency domain analysis for general dynamic loading and support motion for multi-degree of freedom system (MDOF). Time domain analysis using numerical integration scheme for general dynamic loading for MDOF system. Free and forced vibration of continuous systems. Control of dynamic responses. Introduction to various vibration control techniques: TMD; visco-dampen, base insolation etc.

EG 804 CE	Concrete Technology and Design	4 Credits (3-1-0)

Limit state design concepts in flexure, shear, torsion and combined stresses, slender column. Safety and serviceability: control of cracks and deflection, code provisions, Limit state design of beams and frames with emphasis on codal provisions, design detailing for seismic resistance. Yield line analysis of slabs. Design of statically determinate prestressed concrete structures for flexure and shear. Analysis and design of indeterminate prestressed beams and frames. Concrete technology including new types of concrete.

EG 851 CE	Design of Foundation	4 Credits (3-1-0)

Review of : general principles, bearing capacity, settlement and lateral pressure, factors affecting location and depth of foundations. Bearing capacity theories : Terzaghi, Meyerhoff, Brinch Hansen. Stress distribution of soils and settlement analysis. Design of shallow foundations - spread, strip and combined footings, raft footings (conventional finite difference and elastic halfspace methods). Design of deep foundations : piles and pile groups, pile caps, sheet piles. Design of retaining walls, coffer dams and diaphragm walls. Soil dynamics and design of machine foundations. Soil-structure interaction effect in relation to building frames.

EG 852 CE	Seismic Resistant Design of Structures	4 Credits (3-1-0)

Earthquakes and seismicity : causes, mechanisms, measures of earthquakes, attenuation laws, temporal and spatial models of earthquake, response spectrums of earthquake, seismic zoning. Probability theory : random variables, distribution functions, multi-dimensional random variables, conditional probability and statistical independence, central limit theorem, Liapunov's and Linderberg Feller's theorem. Response of single degree of freedom system to support movement. Mode shapes and frequencies of multi-degree of freedom system. Interaction of frame-shear wall or core wall, Analysis of shear wall, core wall and frame-shear wall system. Response spectrum analysis of multi-degree of freedom system (MDOF) for single point excitation; time history analysis of MDOF system for single and multi point excitations. Hydro dynamic effects due to earthquake - pressure against dam, vibration of liquids in tanks, vibration of submerged structures like piers caissons etc. Plastic design of structures for earthquake - simplified design based on energy criterion, ductility factor method. Overview of base isolation concept.

EG 853 CE **Structural Engineering Laboratory** **4 Credits (1-0-3)**

Concrete : properties, tests for fresh and hardened concrete, mix design, non-destructive testing. Reinforced and prestressed concrete : R.C. beams and columns, R.C. slabs, prestressed concrete beams. tests on steel, timber and aluminium sections, Model (perspex) tests on plates and slabs, dynamic tests on SDOF system; determination of mode shapes and frequencies of simple beams and frames. Stress analysis : two and three dimensional photoelasticity.

B. ELECTIVE COURSES

EG 805 CE **Computer Aided Design** **4 Credits (2-0-2)**

Principles of computer aided design, CAD applications, computer peripherals for CAD. Computer graphics fundamentals : generation of points, various forms of lines and curves, 2-D and 3-D transformations etc. Fortran and C language. Application to Engineering Design. Interactive computer programs for the design of structural elements - slabs, beams, columns and footings. Application of analysis and graphic packages. Demonstration for drafting.

EG 806 CE **Construction Methods and Management** **4 Credits (3-1-0)**

Modular co-ordination, standardization, mass production and transportation. Precast and prefabricated construction, joint details. Quality management and reliability, management information system. Value analysis, system design and safety technique.

EG 854 CE **Design of Industrial Structures** **4 Credits (3-1-0)**

Structural steel : structural connection. Design of single and multibay industrial structures in steel and concrete. Roof structures - folded plates, north light roofing, cylindrical shells etc. Gantry girder design. Transmission towers. Bunkers and silos. Pressure vessels, chimneys and cooling towers. Large span roof structures including suspension roofs, flat slabs, waffle slabs etc. Design consideration for vibrating structures.

EG 855 CE Functional Planning and Building Services **4 Credits (3-1-0)**

Components of urban forms and their planning; street system and its layout. Functional planning of buildings - optimization of spaces, spatial synthesis, formulation of linear and nonlinear programming problem. Space requirements and relationships for typical buildings like residential, officials and hospitals. Fire protection of different types of buildings - standard fire, fire resistance, means of escape, classification of buildings. Engineering services in a building as a system - lifts, water system, electrical system etc. Building maintenance - maintenance standards, economic maintenance decision, contingency maintenance planning.

EG 856 CE Application of FEM in Structural Engineering **4 Credits (3-1-0)**

Fundamentals of finite element method; Bases for developing finite elements; Review of principle of virtual work, minimum potential energy. Elements of elasticity. Various types of elements. Solution procedures. Detailed study of application to structures such as dams, frame - shear walls, grid floors and rafts. Application to vibration and buckling problems.

EG 901 CE Rock Slope Engineering **4 Credits (3-1-0)**

Structural mapping and graphical representation of geological data. Mechanics and modes of failure, stability c natural and artificial slopes. Stability of infinite, natural and artificial slopes - analysis by conventional method: Bishop, Janbu and Wedge methods. Hock's stability charts, stability of stratified slopes. Stabilization of slope with anchors and design of anchor system, and their performance. Foundation design in intact, fissured and layere rocks against rapture sliding. Techniques to improve the performance of foundation.

EG 902 CE Design of Bridges **4 Credits (3-1-0)**

Introduction to various aspects of bridge structures. Selection of type. Fundamentals for design and analysis, loa and forces. Grillage analogy. Theories of lateral load distribution and design of superstructure. Abutments, pie and their foundations. Bearings. Expansion joints. Construction methods. Maintenance of bridges. Evaluation existing bridges.