AIN SHAMS UNIVERSITY

GOLDEN JUBILEE 1950 - 2000

Faculty of Engineering

Curriculum Plan

For

Undergraduate Program

January 2000

MINISTRY OF HIGHER EDUCATION
MINISTERIAL DECREE NO. 876 OF 1996
DATED 4.7.1997

Concerning the issue of the statute for
The Faculty of Engineering, Ain - Shams University (For the Undergraduate Stage)

Minister of Higher Education

- Reviewing law No. 49 of 1972, dealing with the organization of universities, and its modification:
- And the Presidential Decree No. 809 of 1975, regarding the issue of the executive statute of the universities organization law, and its modifications:
- And the ministerial decree No. 680 dated 27/10/1974 issuing the statute of the Faculty of engineering, Ain - Shams University, and its modifications:
- And the approval of the committee of the Engineering Studies Sector in its meetings 30 - 31/5/1996:
- And the resolution passed by the Universities Supreme Council on 16/8/1994 deputizing the Minister of Education; the president of the Supreme Council of Universities, to ratify the issuing of the statute of the universities faculties and institutes and its modifications, following the approval of the relevant committees of the university education sectors:

Ruled

The First Article
The undergraduate statute of the Faculty of Engineering, Ain Shams University, shall be in force and shall void any articles contradicting its rules.

The Second Article
This decree is to be published in the Egyptian Transactions, and all those concerned have to implement it.

Minister of Education

CHAPTER ONE

The Faculty Departments and Academic Degrees

Article (1)

The faculty is composed of the following departments:

1. Department of Engineering Physics and Mathematics.
2. Department of Structural Engineering.
3. Department of Irrigation and Hydraulics
4. Department of Public Works
5. Department of Architecture Engineering
6. Department of Urban Planning
7. Department of Electrical Power and Machines Engineering
8. Department of Electronics Engineering and Electrical Communications
9. Department of Computer Engineering and Systems
10. Department of Design and Production Engineering
11. Department of Mechanical Power Engineering
12. Department of Automotive Engineering

Article (2)

The following subjects are assigned to the relevant department to teach and to carry out research work:

1- Department of Engineering Mathematics and Physics

Physics, Mathematics, Mechanics, Descriptive Geometry, Engineering Chemistry, Geology, Applied Statistics, Dynamics and Stability

2- Department of Structural Engineering

Properties and Testing of Materials, Theory of Structures, Properties and Testing of Materials, Structural Analysis, Geotechnical Engineering, Reinforced Concrete Design, Stress Analysis, Civil and Structural Engineering, Steel Structures, Reinforced Concrete Structures, Foundations, Foundation Engineering, Structural Steel Design, Geotechnical and Foundation Engineering, Planning and Control for Construction Projects, Steel Bridges Design, Design of Steel Structures, Civil Project Management, Cold Formed Steel Structures, Computer Analysis of Structures, Construction Equipment, Wall Bearing Structures, Quality Control and Assurance, Inspection and Non Destructive Testing, Special types of Concrete, New Civil Engineering Materials, Soil and Rocks in Dry Regions, Construction Methods, Dynamic Soil Behavior, Microstructure and Fracture Mechanics of Concrete, Polymers in Concrete, Repair and Strengthening of Structures, Fiber Concrete, High Rise Buildings and R.C. Towers, High Rise Buildings, Seismology Engineering, Concrete Durability, Advanced Analysis of R.C. Bridges, Reliability and Fire Safety of R.C. Structures, System Analysis for Structural Engineering, On Site Testing & Construction Technologies of Foundations, Ground Improvement, Soil Structure Interaction, Tunnels and Underground Structures, Modern Trends in Steel Brides,

Behavior of Steel Structures, Design of Special Steel Structures, Plastic Design of Steel Structures, Fabrication Erection and Maintenance of Steel Structures, Management of Project Resources, Reinforced Concrete Shell Roofs.

3- Department of Irrigation and Hydraulics

Civil Engineering Drawing, Fluid Mechanics, Hydraulics, Irrigation and Drainage, Irrigation Design, Environmental Hydraulics, Environmental Hydrology, Harbor Engineering and Navigation, Design of Irrigation Works, Basics of environmental Engineering, Introduction to Water Resources System Analysis, Ground Water Hydrology, Computational Hydraulics, Hydraulic Engineering, Coastal Environment, Computational Methods, Hydrometry, Hydraulic Modeling, Engineering Hydrology, Water Quality Measurements, Environmental Impact Assessment, Modern Irrigation Systems, Inland Navigation, Advanced Irrigation and Drainage, Dam Engineering, Water Resources Engineering, Pumping Stations Engineering, Ground Water Engineering, History of Hydraulic Engineering, Tunnel Engineering.

4- Department of Public Works

Plane Surveying, Surveying, Sanitary Installations in Buildings, Topographic Surveying, Highway and Airport Engineering, Highway and Traffic Engineering, Engineering Surveying, Transportation Planning, Traffic Engineering, Environmental Engineering, Transportation Planning and Railway Engineering, Sanitary Engineering, Highway Engineering and Transportation Planning, Railway Engineering, Airport Engineering, Geographic Information System, Photogrammetry and Remote Sensing, The Earth Gravity Field, Computer Application in Surveying, Principles of Transportation Economics, Traffic System Management, Traffic Impact Analysis, Planning and Management of Public Transport, Surveying With GPS, Maintenance of Highways and Airports, Highway Economics, Industrial Waste Water, Water Treatment for Industrial Purposes, Solid Wastes Management, Environmental Impact Studies, Environmental Evaluation Studies, Economic of Railway Construction and Maintenance, Geodetic Surveying, Construction Technology of Highways and Airports.

5- Department of Architectural Engineering

Human Studies in Architecture, Architectural Design, Sciagraphy and Perspective, Visual Design, Theories of Architecture, History of Art and Architecture, Free Hand Drawing, Building Construction, Computers in Architecture, Environmental Control, Planning and Housing Studies, Landscape Design, Professional Practice and Legislation, Acoustics in Buildings, Building Technology, Working Drawings, Quantities and Specifications, Feasibility Studies and Construction Management, Architectural Design Project Studies, Architectural Rendering, Development of Rural Communities, Urban Sociology, Urban Design, Interior Design, Advanced Computer Applications, Aesthetics in Architecture, Environmental Design and Energy Conservation, Urban and Architectural Heritage, Advanced Technical Installations, Local and Contemporary Architecture, Housing in Developing Countries, Urbane Renewal, Architectural Criticism and Project Evaluation.

6- Department of Urban Planning

History of Planning, Urban Sociology and Geography, Architectural Design, Town Planning and Housing, Landscaping, Computer Applications in Planning,

Environmental Control, Professional Practice and Legislation, Urban Design, Feasibility Studies and Cost Estimation, Planning Law and Legislation, Urban Economy, New Communities and Settlements, Growth of Informal Squatter Areas, Environmental Planning, Environmental and Cultural Elements in Urban Development, Housing Economy, Regional Development and Planning, Informal Housing, City Management, Urban Development in Developing Countries, Planning and Rural Development.

7- Department of Electrical Power and Machines Engineering

Electrical Circuits, Electromagnetic Fields, Electrical Engineering, Electromechanical Engineering, Electrical Testing, Energy Conversion, Electrical Installations in Buildings, Dynamics of Electrical Systems, Electrical Machines, Electrical Measurements and Instruments, Electrical and Electronic Engineering, Electrical Power and Machines, Electrical Engineering, Energy Conversion Systems, Power Electronics, Control of Power Systems, Transmission and Distribution of Electrical Energy, High Voltage Engineering, Utilization of Electrical Energy, Generation and Economics of Electrical Energy, Electrical Power Engineering, Automotive Electrical Equipment, Switch-gear and Protection Engineering, Power System Analysis, Applications in Switch-gear and Protection Systems, Applications in Power Electronics, Advanced Control of Power Systems, Power Electronics Systems Analysis, Power System Protection, Computer Applications in Power Systems, Special Electrical Machines, Microprocessor Applications in Power Systems, Electric Drives, High Voltage Applications, Planning Of Electrical Networks, Generalized Theory of Electrical Machines.

8- Department of Electronics and Electrical Communication Engineering

Electronic Engineering, Electrical Materials, Field Theory, Electrical Measurements, Digital Circuits, Electromagnetic Waves, Electronic Circuits, Electrical Testing, Electronic and Logic Circuits, Electronic Circuits, Digital Communication Systems, Optical Electronic, Electrical Communication Engineering, Communication Systems, Electronic Devices, Microprocessors and Applications, Signal Processing, Telecommunication Networks, Microwave Electronic Engineering, Integrated Circuits, Antennas, Satellite Communications, Analog Artificial Neural Networks, Computer Aided Electronic Design and Manufacture, Computer Interfacing Circuit Design, Application Specific Integrated Circuits (ASICs), Analog Integrated Circuit Design, Electronics for Instrumentation, Integrated Circuits Technology, Digital Signal Processing, Information Theory, Mobile Communications, Data Communications, Personal Communications and Mobile Systems, Antennas, Radar Systems, Optical Communication Systems, Integrated Circuits Applications, Integrated Optics.

9- Department of Computers and Systems Engineering

Introduction to Computers, Computer Engineering, Logic Design, Computer Organization, Computer Hardware Design, Microprocessor Based Systems, Distributed Computer Systems, Computer Interfacing, Computer Peripherals, Computer Networks, Programming Principles, Systems Programming, Numerical Computing Analysis, Software Engineering, Operating Systems, Algorithms and Data

Structures, Local Area Networks, Database Systems, Selected Topics in Computers, Computer Security, Operations Research and Management Systems, Artificial Intelligence, Simulation of Engineering Systems, Machine Learning Systems, Biomedical Systems, Pattern Recognition Image Processing, Expert Systems, Neural Networks, Computer Graphics, Computer Vision, Systems Engineering, Control Components, Process Dynamics, Automatic Control, Control System, Signal Analysis, Industrial Measurements and Testing, Computational Methods in Electrical Engineering, Electrical Testing, Industrial Control, Electrical Testing, Special Control Circuits, Intelligent Control Systems, Selected Topics in Control, Real, Time Systems, Robot Systems.

10- Department of Design and Production Engineering

Production Technology, Engineering Drawing, Engineering Materials, Machine Drawing, Theory of Machines, Metal Casting and Equipment, Machine Construction, Applied Mechanics, Industrial Statistics, Furnaces and Heat Treatment, Elasticity and Plasticity, Thermal and Mechanical Stresses, Joining of Metals, Production Engineering, Mechanical Measuring Equipment, Production Engineering, Applied Mechanics, Machine Construction, Machine Construction, Automatic Control, Vibrations and Automatic Control, Meteorological Measuring Equipment
Machining Technology, Forming Technology, Forming Machines, Work Study, Machine Design, Theory of Metal Forming, Theory of Metal Cutting, Machine Tools, Metrology, Operations Research, Operations Management, Plant Layout, Tools Design and Production Equipment, Industrial Legislation and Economics, Quality Systems, Quality Control, Industrial Organization, Process Quality Control, Total Quality Control, Industrial Project Management, Computer Applications in Industry, Topics in Design and Production Engineering, Engineering Marketing.

11- Department of Mechanical Power Engineering

Thermodynamics, Thermal Engineering, Fluid Dynamics, Heat and Mass Transfer, Heat Engines, Heat Transfer, Automatic Control, Combustion Engines, Thermal Plant, Measurements, Fluid Machinery, Air Conditioning in Buildings, Combustion, Refrigeration and Air Conditioning, Energy Plant, New and Renewable Energy, Thermal Processes, Mechatronic, Pipe Line Networks, Control Of Fluid Power, Control Applications in Refrigeration and Conditioning, Control Applications in Fluid Machinery, Control Applications in Thermal Engineering, Computer Applications.

12- Department of Automotive Engineering

Automotive Engines, Automotive Technology, Automotive Design, Automotive Engineering, Fuel Management, Car Measuring Instruments, Maintenance Engineering, Project, Planning of Service Stations, Vehicle Automatic Control Systems, Vehicle Repair, Transport Economics, Use of Natural Gas in Car Engines, Vehicle Aerodynamics, Pneumatic and Hydraulic Systems, Pollution from Vehicles, Brake Systems, Material Handling Equipment, Earth Moving and Construction Equipment, Vehicle Manufacture, Heavy Vehicle Dynamics, Analysis of Car Accidents, Car Electronics.

Article (3)

The faculty council shall assign one department or more to supervise the general subjects belonging to humanities and social sciences, viz:

Technical English Language - History Of Technology - Technical Report Writing - Legislation And Contracts- Projects - Economics - Planning And Follow Up (Site Management) Of Construcural Projects - Civil Project Management - Environmental Control - Environment Influence Of Projects - International Relations - Environment And Public Service - Contemporary Economics - Management And Marketing - Scientific Thinking - Philosophical Thinking - Literary Appreciation - Artistic Appreciation.

Article (4)

The Ain Shams University, upon the request of the faculty of engineering council, awards the following academic degrees:

1. Bachelor degree in one of the branches indicated in article (5) in this statute.
2. Diploma of high studies in one of the branches indicated in this statute.
3. Master degree in engineering.
4. Doctor of philosophy degree in engineering.

CHAPTER TWO

The Bachelor Degree of Science

Article (5)

The Ain Shams University, upon the request of the faculty of engineering council, awards the bachelor degree of science in one of the following specialization:

1. **Civil Engineering in one of the Following Sections:**
   a) Constructional
   b) Water And Hydraulic Structures
   c) Public Works
2. **Architectural Engineering in one of the Following Sections:**
   a) Architecture
   b) Urban Planning and Design
3. **Electrical Engineering in one of the Following Sections:**
   a) Electrical Power And Machines
   b) Electronics and Electrical Communications
   c) Computers and Systems
4. **Mechanical Engineering in one of the Following Sections:**
   a) Production
   b) Mechanical Power
   c) Automotive

Article (6)

The required period of study in the faculty to obtain a B.Sc. degree is five academic years. It starts with a preparatory year, which is general and common for all students. Specialization follows from first year according to the tables of the curricula shown in article (15) of this statute.

Article (7)

A student may be exempted from the attendance of some courses, other than those of the final year, if he produces evidence of attending equivalent courses in another recognized university faculty or scientific institute.
Also, a student may be exempted from examinations some such courses if he produces evidence of successfully passed equivalent examinations in a university or scientific institute recognized by the university. Exemption will be issued by a resolution of the university president after the approval of students affairs council upon the proposal of the faculty council and the recommendation of the department council or the relevant departments councils, without breaching the ruling of article (36) of the universities organization law.

Article (8)

Each department will prepare a scheme for practical training for its first, second and third year students during the summer vacation for at least three weeks annually inside or outside the faculty. This training is to be exercised under the supervision of members of staff within the available facilities. Preparatory year students will take training during the summer vacation in the engineering drawing course for at least three weeks inside the faculty. It forms a part in the year's work of the engineering drawing course of the preparatory year.

Article (9)

Promotion and B.Sc. degree examinations are held at the end of each semester in all courses the student has studied in his class and in referred courses from previous classes, according to the tables given in article (15) of this statute.
Upon the request of the relevant department councils, the faculty council issues a resolution prohibiting the student to sit for the examination in the courses not satisfying 75% attendance. In this case the student is considered to have failed in the courses he has been prohibited from sitting their examination unless he provides an excuse acceptable to the faculty council. In such a case the student is considered absent with acceptable excuse.

Article (10)

The fourth year students are required to prepare and submit their final graduation project. The relevant departmental councils select the topics of the project. An extra period of four weeks after the final examinations is devoted for all specializations to work on the project. Moreover, the second semester is dedicated for the project for the architectural students in both architecture section and the urban planning and design section.

Article (11)

a. The student is considered successful if he passes the examinations in all courses of his class.
b. The student is promoted to the next higher level if he fails in not more than two subjects of his class or from lower classes.
c. In addition to the two subjects mentioned in the pervious item, the student who fails in two subjects in humanities and social sciences, whether from his class or from lower classes, is admitted to the transfer to the consecutive higher level.

Passing successfully in all courses before obtaining the B.Sc. degree is a prerequisite.

d. The student has to sit the examination in the courses in which he has failed together with the students studying the same courses. The student gets a pass grade when he passes the examination successfully.

Article (12)

Supplementary examinations are to be held yearly in October for the fourth year students failing in at most two courses from their class or from any lower level, in addition to the courses in humanities and social studies the students have failed in them. However, the project has no supplementary examination.

Article (13)

If the examination in one course includes a written paper as well as practical or oral examination, the total mark in this course consists of the sum of the written, practical, oral and the year's work. The student who absents himself in the written examination is considered absent in the course and no mark is recorded for it.

Article (14)

The grades of the successful student in a course and in the general grade are evaluated as follows.

Distinction : from 85% of the total mark and upwards.
Very good : from 75% to less than 85% of the total mark.
Good : from 65% to less than 75% of the total mark
Pass : from 50% to less than 65% of the total mark

The grades of a failing student in a course is estimated in one of the following grades:

Weak : from 30% to less than 50% of the total mark
Very weak : less than 30% of the total mark.

The B.Sc. general grade for students is based on the cumulative marks obtained during all the years of study. The students are then arranged serially according to their cumulative sum.

The student is awarded an honor degree if his cumulative sum is distinction or very good provided that he gets a grade not less than very good in any class of study other than the preparatory year. Moreover, he should have not failed in any examination he has sat in any class other than the preparatory year.

Article (15)

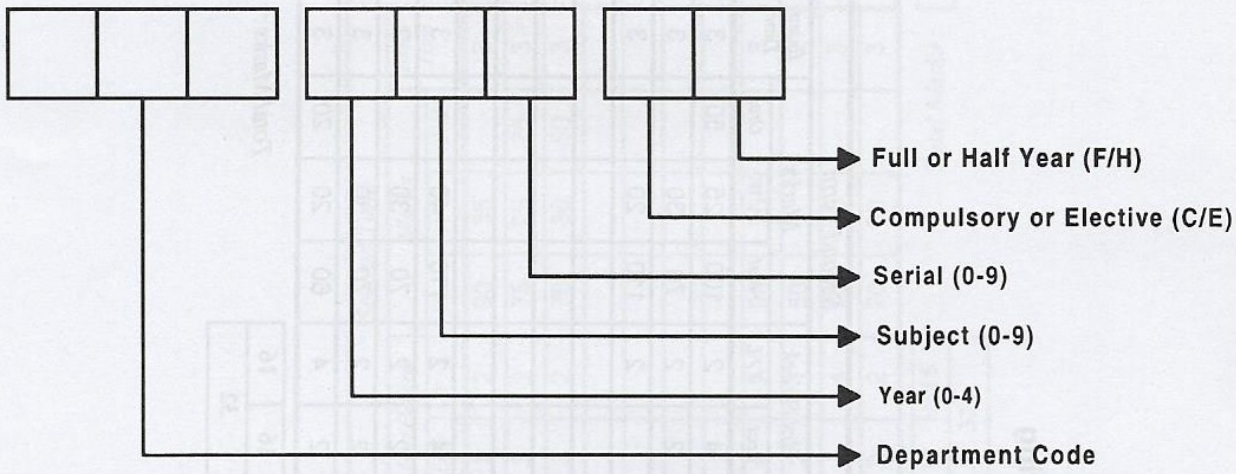
a. Annexed tables (1 to 36) give the courses and the weekly hours allocated for lectures and the laboratory exercises for each course and the corresponding examination time allowed for the written paper as well as the practical and oral examination divided among the two semesters. The faculty council approves the contents of each course upon their determination by the relevant departments.

b. Each department has to specify every academic year the elective courses to be offered during this year from the relevant list of elective courses according to course tables give in this article. The specified elective courses have to be announced to students before the beginning of the academic year.

Distribution Sketch of Faculty Specializations and Sectionalizations

Year	Specialization and Sectionalization		
Preparatory	General		
First	General		
Second	Civil Engineering	Constructural	
		Water and Hydraulic Structures	
		Public Works	
	Architectural Engineering	Architecture	
		Urban Planning and Design	
Third	Electrical Engineering	Electrical Power and Machines	
		Electronics and Electrical Communications	
		Computers and Systems	Computers
			Systems
Fourth	Mechanical Engineering	Production	
		Mechanical Power	
		Automotive	

Course Coding System



Scientific Departments

Department	Code
Department of Engineering Mathematics & Physics	PHM
Department of Structure Engineering	CES
Department of Irrigation & Hydraulics	CEI
Department of Public Works	CEP
Department of Architecture Engineering	ARC
Department of Urban Planing	UPL
Department of Power & Electrical Machines Engineering	EPM
Department of Electronics & Electrical Communication Engineering	ECE
Department of Computers & Systems Engineering	CSE
Department of Design & Production Engineering	MDP
Department of Mechanical Power Engineering	MEP
Department of Automotive Engineering	MEA
Department of Humanities & Social Sciences	HUM

Note: Humanities & Social Sciences is not one of the faculty's departments.

Faculty of Engineering

Table No : 1

Preparatory Year — **General Engineering**

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
PHM 020 CF	Physics (1)	4	2	100	25		3	4	2	100	25	50	3	300
PHM 030 CF	Mechanics (1)	2	2	70	30		3	2	2	70	30		3	200
MDP 011 CF	Engineering Drawing		4		20				2	110	20		3	150
PHM 010 CH	Mathematics (1)	4	2	110	40		3							150
PHM 050 CH	Engineering Chemistry	4	2	100	25	25	3							150
HUM 010 CH	Technical English Language	2	1	35	15		2							50
HUM 020 CH	History of Engineering and Technology	2	1	35	15		2							50
PHM 011 CH	Mathematics (2)							4	2	110	40		3	150
PHM 040 CH	Descriptive Geometry							2	2	70	30		3	100
CSE 010 CH	Introduction to Computers							2	2	70	30		3	100
MDP 012 CH	Production Technology							2	4	60	20	20	3	100
		18	14					16	16					Total Marks : 1500
	Total Hrs /Week :	32						32						

Faculty of Engineering

Table No : 2

First Year **Civil Engineering**

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CES 111 CF	Structural Analysis (1)	3	2	90	35		3	3	2	90	35		3	250
CES 121 CF	Properties and Testing of Materials (1)	3	2	75	25	25	3	3	2	75	25	25	3	250
CEP 100 CF	Plane Surveying	3	2	70	30		3	3	2	70	30	50	3	250
PHM 110 CH	Mathematics (3)	4	2	90	35		3							125
PHM 131 CH	Mechanics (2)	2	2	70	30		3							100
EPM 100 CH	Electromechanical Engineering	4		70	30		3							100
HUM 121 CH	Legislation and Contracts	2	1	35	15		2							50
PHM 111 CH	Mathematics (4)							4	2	90	35		3	125
PHM 161 CH	Geology							2	1	50			2	50
CEI 131 CH	Civil Engineering Drawing								4	70	30		3	100
ARC 110 CH	Building Construction							2	2	70	30		3	100
		21	11					17	15					
	Total Hrs /Week :	32						32					*Total Marks :*	1500

Faculty of Engineering

Table No : 3

Second Year — Civil Engineering

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CES 214 CF	Structural Analysis (2)	3	2	90	35		4	3	2	90	35		4	250
CES 232 CF	Reinforced Concrete Design (1)	2	2	70	30		3	2	2	70	30		3	200
CEP 200 CF	Topographic Surveying	2	2	60	20		3	2	2	60	20	40	3	200
CES 222 CH	Properties and Testing of Materials (2)	4	2	90	30	30	3							150
CEI 221 CH	Fluid Mechanics (1)	4	2	90	30	30	3							150
CSE 229 CH	Numerical Computing Analysis	2	2	50	25		3							75
HUM 2xx EH	Humanity Elective Course (1)	2	1	35	15		2							50
CES 242 CH	Geotechnical Engineering (1)							4	2	90	30	30	3	150
CEI 222 CH	Hydraulics							2	2	60	20	20	3	100
CEI 241 CH	Irrigation and Drainage							4	2	90	35		3	125
HUM 223 CH	Economics							2	1	35	15		2	50
		19	13					19	13					
Total Hrs /Week :		32						*Total Hrs /Week :* 32						*Total Marks :* 1500

Faculty of Engineering

Table No : 4

Third Year **Civil Engineering**

Structure

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T / L	Final	Y. W.	Oral		Lect	T / L	Final	Y. W.	Oral		
CES 315 CF	Structural Analysis (3)	2	2	70	30		3	2	2	70	30		3	200
CES 333 CF	Reinforced Concrete Design (2)	2	2	70	30		3	2	2	70	30		3	200
CES 351 CF	Structural Steel Design	2	2	70	30		3	2	2	70	30		3	200
PHM 334 CH	Dynamics and Stability	2	2	70	30		3							100
CES 343 CH	Geotechnical Engineering (2)	4	2	90	30	30	3							150
CEI 353 CH	Irrigation Design	4	2	110	40		3							150
CES 3xx EH	Elective Course (1)	2	2	70	30		3							100
CES 344 CH	Foundation Engineering (1)							4	2	90	30	30	3	150
CEP 332 CH	Highway and Traffic Engineering							2	1	50	25		2	75
CEP 341 CH	Transportation Planning and Railway Enginee							2	1	50	25		3	75
HUM 311 CH	Technical Report Writing							2	1	35	15		2	50
HUM 322 CH	Project Management							2	1	35	15		2	50
		18	**14**					**18**	**12**					
	Total Hrs /Week :	**32**						*Total Hrs /Week :*	**30**					*Total Marks :* **1500**

Faculty of Engineering

Table No : 5

Fourth Year **Civil Engineering**

Structure

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T / L	Final	Y. W.	Oral		Lect	T / L	Final	Y. W.	Oral		
CES 434 CF	Reinforced Concrete Design (3)	2	2	70	30		3	2	2	70	30		3	200
CES 452 CF	Steel Bridges Design	3	2	70	30		3	3	2	70	30		3	200
CES 417 CH	Advanced Structural Analysis	2	2	70	30		3							100
CES 445 CH	Foundation Engineering (2)	2	2	70	30		3							100
CEP 470 CH	Environmental Engineering	4	2	110	40		3							150
CES 4xx EH	Elective Course (2)	2	2	70	30		3							100
CES 4xx EH	Elective Course (3)	2	2	70	30		3							100
CES 435 CH	Reinforced Concrete Design (4)							2	2	70	30		3	100
CES 491 CH	Planning and Control for Construction Projects							2	2	70	30		3	100
CES 499 CH	Project							2	4			200		200
CES 4xx EH	Elective Course (4)							2	2	70	30		3	100
HUM 4xx EH	Humanity Elective Course (2)							2	1	35	15		2	50
		17	14					15	15					
	Total Hrs /Week :	31						*Total Hrs /Week :*	30					*Total Marks :* 1500

Faculty of Engineering

Table No : 6

Third Year **Civil Engineering**

Water and Hydraulic Structures

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T / L	Final	Y. W.	Oral		Lect	T / L	Final	Y. W.	Oral		
CES 333 CF	Reinforced Concrete Design (2)	2	2	70	30		3	2	2	70	30		3	200
CEI 303 CF	Irrigation Design (1)	2	2	70	30		3	2	2	70	30		3	200
PHM 310 CH	Applied Statistics	2	1	20	30		2							50
CES 310 CH	Structural Analysis	2	2	70	30		3							100
CES 340 CH	Geotechnical Engineering (2)	2	2	70	30		3							100
CEI 301 CH	Environmental Hydraulics	4	2	90	30	30	3							150
CEP 301 CH	Engineering Surveying	2	2	60	20	20	3							100
HUM 322 CH	Project Management	2	1	35	15		2							50
CES 349 CH	Foundation Engineering (1)							2	2	70	30		3	100
CES 350 CH	Structural Steel Design (1)							4	2	70	30		3	100
CEI 302 CH	Environmental Hydrology							2	2	70	30		3	100
CEP 333 CH	Highway Engineering and Transportation Plan							2	2	70	30		3	100
CEP 361 CH	Sanitary Engineering (1)							2	1	70	30		3	100
HUM 311 CH	Technical Report Writing							2	1	35	15		2	50
	Total Hrs /Week :	18	14					18	14					*Total Marks :* 1500
		32						32						

Faculty of Engineering

Table No : 7

Fourth Year — Civil Engineering

Water and Hydraulic Structures

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CES 430 CF	Reinforced Concrete	2	2					2	2	110	40		4	150
CEI 401 CF	Harbor Engineering And Navigation	2	1	50	25		3	2	1	50	25		3	150
CEI 403 CF	Design of Irrigation Works	2	2	70	30		3	2	2	70	30		3	200
CES 440 CH	Foundation Engineering (2)	2	2	70	30		3							100
CEP 461 CH	Sanitary Engineering (2)	2	2	70	30		3							100
CEI 4xx EH	Elective Course (1)	2	2	70	30		3							100
CEI 4xx EH	Elective Course (2)	2	2	70	30		3							100
HUM 4xx EH	Humanity Elective Course (2)	2	1	35	15		3							50
CES 459 CH	Steel Structures (2)							2	2	70	30		3	100
CEI 450 CH	Project							2	4			200		200
CEP 431 CH	Highway and Traffic Engineering							2	1	35	15		2	50
CEI 4xx EH	Elective Course (2)							2	2	70	30		3	100
CEI 4xx EH	Elective Course (3)							2	2	70	30		3	100
		16	14					16	16					
	Total Hrs /Week :	30						*Total Hrs /Week :*	32					

Total Marks : **1500**

Faculty of Engineering

Table No : 8

Third Year **Civil Engineering**

Public Works

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CES 330 CF	Reinforced Concrete Design (2)	2	2	50	25		3	2	2	50	25		3	150
CEP 300 CF	Engineering Surveying	2	2	70	30		3	2	2	70	30		3	200
CES 311 CH	Structural Analysis	2	1	70	30		3							100
CES 348 CH	Geotechnical and Foundation Engineering	4	2	100	50		3							150
CEI 332 CH	Hydraulics (2)	2	2	70	30		3							100
CEP 350 CH	Transportation Planning	2	2	70	30		3							100
CEP 370 CH	Environmental Engineering	2	2	70	30		3							100
HUM 3xx EH	Humanity Elective Course (2)	2	1	35	15		2							50
CEI 331 CH	Irrigation Design							4	3	100	50		3	150
CEP 330 CH	Highway and Airport Engineering (1)							4	2	110	40		3	150
CEP 331 CH	Traffic Engineering							2	2	70	30		3	100
CEP 360 CH	Sanitary Engineering (1)							4	2	110	40		3	150
		18	14					18	13					
Total Hrs /Week :		32						31						

Total Marks : **1500**

Faculty of Engineering

Table No : 9

Fourth Year **Civil Engineering**

Public Works

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T / L	Final	Y. W.	Oral		Lect	T / L	Final	Y. W.	Oral		
CES 436 CF	Reinforced Concrete Design (3)	2	2		25			2	2	100	25		3	150
CES 450 CF	Design of Steel Structures	2	1	30	20		3	3	2	70	30		3	150
CEP 440 CF	Railway Engineering	2	2	50	30		3	4	2	90	30		3	200
CEP 430 CH	Highway and Airport Engineering (2)	4	2	110	40		3							150
HUM 411 CH	Technical Report Writing	2	1	35	15		2							50
CEP 41x EH	Elective Course (1)	4	2	110	40		3							150
CEP 46x EH	Elective Course (2)	4	2	110	40		3							150
CES 492 CH	Civil Project Management							2	2	70	30		3	100
CEP 499 CH	Project							1	3			200		200
CEP 4xx EH	Elective Course (3)							2	2	70	30		3	100
CEP 4xx EH	Elective Course (4)							2	2	70	30		3	100
		20	12					16	15					
	Total Hrs /Week :	32						*Total Hrs /Week :*	31					*Total Marks :* 1500

Faculty of Engineering

Table No : 10

First Year **Architecture Engineering**

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
ARC 101 CF	Architectural Design (1)		8		120				8	160	120		8	400
ARC 111 CF	Building Construction (1)	2	2		60			2	2	80	60		5	200
CES 100 CH	Theory of Structures	4	4	110	40		4							150
CES 120 CH	Properties and Testing of Materials	2	2	60	20	20	3							100
ARC 131 CH	Theories of Architecture (1)	4		60	40		3							100
ARC 151 CH	Visual Design	2	2	40	60		3							100
CEP 101 CH	Surveying							2	2	60	20	20	3	100
ARC 130 CH	History of Art and Architecture (1)							4		60	40		3	100
ARC 141 CH	Human Studies in Architecture							2		30	20		2	50
ARC 150 CH	Free Hand Drawing								2	20	30		3	50
ARC 161 CH	Sciagraphy and Perspective							4	4	60	90		7	150
		14	18					14	18					
Total Hrs /Week :		32						32						*Total Marks :* 1500

Faculty of Engineering

Table No : 11

Second Year **Architecture Engineering**

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CES 230 CF	Reinforced Concrete Structures	2	2		15			2	2	70	15		4	100
ARC 202 CF	Architectural Design (2)		8		120				8	160	120		9	400
ARC 212 CF	Building Construction (2)	2	2		60			2	2	80	60		5	200
CEP 260 CH	Sanitary Installations in Buildings	2		35	15		2							50
ARC 232 CH	Theories of Architecture (2)	4		60	40		3							100
ARC 271 CH	Computers in Architecture	2	2	40	60		3							100
UPL 211 CH	History of Planning	4		60	40		3							100
EPM 200 CH	Electrical Installations in Buildings	2		35	15		2							50
CES 240 CH	Foundations							2	2	70	30		3	100
CES 250 CH	Steel Structures							4	2	110	40		4	150
ARC 230 CH	History of Art and Architecture (2)							4		60	40		3	100
ARC 281 CH	Environmental Control							2		35	15		2	50
		18	14					16	16					
	Total Hrs /Week :	32						*Total Hrs /Week :*	32					*Total Marks :* 1500

Faculty of Engineering

Table No : 12

Third Year **Architecture Engineering**

Architecture

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
ARC 303 CF	Architectural Design (3)		8		120				8	160	120		9	400
ARC 311 CF	Working Drawings (1)		6		90				6	120	90		7	300
ARC 312 CF	Planning and Housing Studies (1)	2	4		60			2	4	80	60		4	200
ARC 333 CH	Theories of Architecture (3)	4		60	40		3							100
ARC 341 CH	Professional Practice and Legislation	4		60	40		3							100
MEP 324 CH	Air Conditioning in Buildings	2		35	15		2							50
ARC 3xx EH	Elective Course (1)	2		50			2							50
ARC 313 CH	Building Technology							4		60	40		3	100
ARC 321 CH	Landscape Design							2	2	40	60		3	100
ARC 381 CH	Acoustics in Buildings							2		35	15		2	50
ARC 3xx EH	Elective Course (2)							2		50			2	50
		14	18					12	20					
Total Hrs /Week :		32						*Total Hrs /Week :*	32				*Total Marks :*	1500

Faculty of Engineering

Table No : 13

Fourth Year — **Architecture Engineering**

Architecture

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
ARC 400 CH	Architectural Design Project Studies	1	1	50			2							50
ARC 404 CH	Architectural Design (4)		8	120	180		9							300
ARC 412 CH	Working Drawings (2)		6	80	120		7							200
ARC 413 CH	Planning and Housing Studies (2)		4	80	120		4							200
ARC 434 CH	Theories of Architecture (4)	3		90	60		3							150
ARC 490 CH	Quantities and Specifications	1	1	60	40		3							100
ARC 491 CH	Feasibility Studies and Construction Managem	2	1	60	40		3							100
ARC 4xx EH	Elective Course (3)	2		50			2							50
ARC 4xx EH	Elective Course (4)	2		50			2							50
ARC 401 CH	Project								32			300		300
		11	21					0	32					
	Total Hrs /Week :	32						*Total Hrs /Week :*	32					*Total Marks :* 1500

Faculty of Engineering

Table No : 14

Third Year **Architecture Engineering**

Urban Planning and Design

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
UPL 302 CF	Town Planning and Housing (1)	2	4		40			2	4	140	40	30	6	250
UPL 303 CF	Urban Design (1)	2	5		45			2	5	150	45	60	7	300
UPL 321 CF	Architectural Design		8		50				8	150	50	50	7	300
UPL 304 CH	Landscaping	3		70	30		3							100
UPL 306 CH	Professional Practice and Legislation	2		30	20		2							50
UPL 322 CH	Environmental Control	3		70	30		3							100
UPL 3xx EH	Elective Course (1)	2	1	70	30		3							100
UPL 301 CH	Urban Sociology and Geography							4		70	30		3	100
UPL 305 CH	Computer Applications in Planning							4		70	30		3	100
UPL 3xx EH	Elective Course (2)							2	1	70	30		3	100
		14	18					14	18					
Total Hrs /Week :		32						32					*Total Marks :*	1500

Faculty of Engineering

Table No : 15

Fourth Year — **Architecture Engineering**

Urban Planning and Design

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CEP 432 CH	Highway and Traffic Engineering	1		35	15		2							50
UPL 401 CH	Urban Economy	2		25	15	10	2							50
UPL 402 CH	Town Planning (2)	2	3	100	60	40	5							200
UPL 403 CH	Urban Design	2	7	90	150	60	9							300
UPL 404 CH	Feasibility Studies and Cost Estimation	2		50	30	20	3							100
UPL 405 CH	Planning Law and Legislation	1		25	15	10	3							50
UPL 421 CH	Architectural Design		6	50	80	20	3							150
UPL 4xx EH	Elective Course (3)	2	1	70	30		3							100
UPL 4xx EH	Elective Course (4)	2	1	70	30		3							100
UPL 450 CH	Project								32			400		400

Total Hrs /Week :	14	18	*Total Hrs /Week :*	0	32	*Total Marks :* 1500
	32			32		

Faculty of Engineering

Table No : 16

First Year **Electrical Engineering**

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
PHM 122 CF	Physics (2)	3	2	60	20		3	3	2	60	20	40	3	200
EPM 102 CF	Electrical Circuits (1)	2	1		25			2	1	100	25		3	150
PHM 112 CH	Mathematics (3)	4	2	90	35		3							125
PHM 132 CH	Mechanics (2)	2	1	70	30		3							100
CEI 121 CH	Fluid Mechanics	2	2	70	30		3							100
ECE 130 CH	Electrical Materials	3	1	70	30		3							100
MEP 121 CH	Thermodynamics	2	1	70	30		3							100
HUM 111 CH	Technical Report Writing	2	1	35	15		2							50
PHM 113 CH	Mathematics (4)							4	2	90	35		3	125
EPM 101 CH	Electromagnetic Fields							3	1	70	30		3	100
EPM 171 CH	Electrical Testing (1)								3	60	20	20	3	100
ECE 131 CH	Electronic Engineering (1)							3	1	70	30		3	100
CSE 120 CH	Numerical Computing Analysis							2	2	70	30		3	100
HUM 121 CH	Legislation and Contracts							2	1	35	15		2	50
		20	11					19	13					
Total Hrs /Week :		31						32						*Total Marks :* 1500

Faculty of Engineering

Table No : 17

Second Year **Electrical Engineering**

Power and Electrical Machines

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
PHM 210 CF	Mathematics (5)	4	2	80	40		3	3	1	60	20		3	200
EPM 272 CF	Electrical Testing (2)		4		10				4	60	10	20	3	100
EPM 203 CH	Electrical Circuits (2)	3	2	100	50		3							150
EPM 204 CH	Energy Conversion	3	2	100	50		3							150
EPM 205 CH	Electrical Measurements and Instruments (1)	3	1	70	30		3							100
ECE 244 CH	Electronic and Logic Circuits	3	2	100	50		3							150
HUM 222 CH	Project Management	2	1	35	15		2							50
CEI 225 CH	Hydraulics							2	2	70	30		3	100
EPM 206 CH	Electrical Measurements and Instruments (2)							3	1	70	30		3	100
EPM 211 CH	Electrical Machines (1)							3	2	100	50		3	150
EPM 251 CH	Dynamics of Electrical Systems							3	1	70	30		3	100
MEP 223 CH	Heat Engines							3	1	70	30		3	100
HUM 2xx EH	Humanity Elective Course (1)							2	1	35	15		2	50
		18	14					19	13					
Total Hrs /Week :		32						*Total Hrs /Week :*	32					

Total Marks : **1500**

Faculty of Engineering

Table No : 18

Third Year **Electrical Engineering**

Power and Electrical Machines

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
EPM 373 CF	Electrical Testing (3)		4		10				4	60	10	20	3	100
EPM 312 CH	Electrical Machines (2)	3	2	100	50		3							150
EPM 321 CH	Transmission and Distribution of Electrical En	3	2	100	50		3							150
EPM 331 CH	High Voltage Engineering (1)	3	1	70	30		3							100
EPM 352 CH	Control of Power Systems (1)	3	2	100	50		3							150
ECE 352 CH	Electrical Communication Engineering	3	1	70	30		3							100
HUM 323 CH	Economics	2	1	35	15		2							50
EPM 322 CH	Transmission and Distribution of Electrical En							3	2	100	50		3	150
EPM 324 CH	Generation and Economics of Electrical Energ							3	1	70	30		3	100
EPM 332 CH	High Voltage Engineering (2)							3	2	100	50		3	150
EPM 361 CH	Power Electronics							3	1	70	30		3	100
EPM 381 CH	Utilization of Electrical Energy							3	1	70	30		3	100
CSE 328 CH	Computational Methods in Electrical Engineeri							3	1	70	30		3	100
		17	13					18	12					
Total Hrs /Week :		30						*Total Hrs /Week :* 30						*Total Marks :* 1500

Faculty of Engineering

Table No : 19

Fourth Year **Electrical Engineering**

Power and Electrical Machines

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
EPM 400 CF	Project		4						4			200		200
EPM 474 CF	Electrical Testing (4)		4		10				4	60	10	20	3	100
EPM 413 CH	Electrical Machines (3)	3	2	100	50		3							150
EPM 425 CH	Power System Analysis (1)	3	1	70	30		3							100
EPM 441 CH	Switchgear and Protection Engineering	3	1	70	30		3							100
HUM 426 CH	Environmental Control	2	1	35	15		2							50
EPM 4xx EH	Elective Course (1)	3	1	70	30		3							100
EPM 4xx EH	Elective Course (2)	3	1	70	30		3							100
EPM 414 CH	Electrical Machines (4)							3	2	100	50		3	150
EPM 426 CH	Power System Analysis (2)							3	2	100	50		3	150
EPM 453 CH	Control of Power Systems (2)							3	1	70	30		3	100
EPM 4xx EH	Elective Course (3)							3	1	70	30		3	100
EPM 4xx EH	Elective Course (4)							3	1	70	30		3	100
		17	15					15	15					
Total Hrs /Week :		32						30					*Total Marks :*	1500

Faculty of Engineering

Table No : 20

Second Year **Electrical Engineering**

Electronics and Electrical Communicatio

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
PHM 211 CF	Mathematics (5)	3	1	50	25		3	3	1	50	25		3	150
ECE 272 CF	Electrical Testing (2)		4		10				4	60	10	20	3	100
CES 200 CH	Civil and Structural Engineering	2	1	70	30		3							100
ECE 232 CH	Electronic Engineering (2)	3	2	90	35		3							125
ECE 241 CH	Electronic Circuit (1)	3	2	90	35		3							125
ECE 261 CH	Field Theory	3	2	90	35		3							125
CSE 218 CH	Computer Engineering	2	1	70	30		3							100
HUM 2xx EH	Humanity Elective Course (1)	2	1	35	15		2							50
EPM 220 CH	Electrical Power and Machines							3	1	90	35		3	125
ECE 221 CH	Electrical Measurements							3	2	90	35		3	125
ECE 242 CH	Electronic Circuit (2)							3	2	90	35		3	125
ECE 243 CH	Digital Circuits (1)							3	2	90	35		3	125
ECE 262 CH	Electromagnetic Waves (1)							3	2	90	35		3	125
		18	14					18	14					Total Marks : 1500
	Total Hrs /Week :	32						32						

Faculty of Engineering

Table No : 21

Third Year **Electrical Engineering**

Electronics and Electrical Communicatio

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
ECE 353 CF	Communication Systems (1)	3	2		30			3	2	140	30		3	200
ECE 372 CF	Electrical Testing (3)		4		10				4	60	10	20	3	100
ECE 333 CH	Electronic Devices	3	2	100	50		3							150
ECE 345 CH	Digital Circuits (2)	3	2	100	50		3							150
ECE 354 CH	Signal Processing	3	2	100	50		3							150
ECE 363 CH	Electromagnetic Waves (2)	3	2	100	50		3							150
HUM 322 CH	Project Management	2	1	35	15		2							50
ECE 334 CH	Optical Electronic							3	2	100	50		3	150
ECE 373 CH	Microprocessors and Applications							3	2	100	50		3	150
CSE 319 CH	Operating Systems							3	1	70	30		3	100
CSE 327 CH	Automatic Control							3	1	70	30		3	100
HUM 323 CH	Economics							2	1	35	15		2	50
		17	15					17	13					
Total Hrs /Week :		32						*Total Hrs /Week :*	30					*Total Marks :* 1500

Faculty of Engineering

Table No : 22

Fourth Year **Electrical Engineering**

Electronics and Electrical Communicatio

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
ECE 474 CF	Electrical Testing (4)		4		10				4	75	10	30	3	125
ECE 490 CF	Project		2						4			200		200
ECE 435 CH	Microwave Electronic Engineering	3	2	90	35		3							125
ECE 455 CH	Communication Systems (2)	3	2	90	35		3							125
ECE 481 CH	Integrated Circuits	3	2	90	35		3							125
ECE 4xx EH	Elective Course (1)	3	2	90	35		3							125
ECE 4xx EH	Elective Course (2)	3	2	90	35		3							125
ECE 456 CH	Telecommunication Networks							3	2	90	35		3	125
ECE 464 CH	Antennas							3	2	90	35		3	125
ECE 4xx EH	Elective Course (3)							3	2	90	35		3	125
ECE 4xx EH	Elective Course (4)							3	2	90	35		3	125
HUM 440 EH	Human Elective Course (2)							2	1	35	15		2	50
		15	16					14	17					
	Total Hrs /Week :	31						31					*Total Marks :*	1500

Faculty of Engineering

Table No : 23

Second Year **Electrical Engineering**

Computer and Systems

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
PHM 212 CF	Mathematics (5)	4	2	70	30		3	4	2	70	30		3	200
ECE 245 CF	Electronic Circuits	3	1					3	1	140	60		3	200
CSE 201 CF	Measurement and Electrical Testing	2	3		20			2	3	120	20	40	3	200
CSE 202 CH	Logic Design	3	1	70	30		3							100
CSE 210 CH	Programming Principles	2	1	70	30		3							100
CSE 220 CH	Systems Engineering	2	1	70	30		3							100
CSE 221 CH	Process Dynamics	3	1	70	30		3							100
HUM 222 CH	Project Management	2	1	35	15		2							50
EPM 210 CH	Energy Conversion Systems							2	1	70	30		3	100
ECE 251 CH	Digital Communication Systems							3	1	70	30		3	100
CSE 212 CH	Computer Organization (1)							3	1	70	30		3	100
CSE 222 CH	Control Components							2	1	70	30		3	100
HUM 2xx EH	Humanity Elective Course (1)							2	1	35	15		2	50

Total Hrs /Week :	21 | 11	*Total Hrs /Week :*	21 | 11	*Total Marks :* 1500
	32		32	

Faculty of Engineering

Table No : 24

Third Year — **Electrical Engineering**

Computer and Systems

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CSE 301 CF	Industrial Measurements and Testing	2	4		30			2	4	100	30	40	3	200
CSE 312 CF	Computer Organization	3	2		30			3	2	140	30		3	200
CSE 313 CH	Computer Networks (1)	3	1	70	30		3							100
CSE 314 CH	Computer Hardware Design	3	1	70	30		3							100
CSE 315 CH	Systems Programming	2	1	70	30		3							100
CSE 321 CH	Signal Analysis	2	1	70	30		3							100
CSE 322 CH	Control System (1)	3	1	70	30		3							100
HUM 323 CH	Economics	2	1	35	15		2							50
CSE 316 CH	Operating Systems							3	1	70	30		3	100
CSE 317 CH	Software Engineering							3	1	70	30		3	100
CSE 318 CH	Algorithms and Data Structures							2	1	70	30		3	100
CSE 323 CH	Control System (2)							3	1	70	30		3	100
CSE 325 CH	Microprocessor, Based Systems							2	1	70	30		3	100
HUM 3xx CH	Humanity Elective Course (2)							2	1	35	15		2	50
	Total Hrs /Week :	20	12					*Total Hrs /Week :*	20	12				*Total Marks :* 1500
		32							32					

Faculty of Engineering

Table No : 25

Fourth Year **Electrical Engineering**

Computer and Systems (Computers)

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CSE 401 CF	Electrical Testing		4		10				4	60	10	20	3	100
CSE 491 CF	Project	1	2					1	4			300		300
CSE 411 CH	Computer Interfacing	4	2	100	50		3							150
CSE 412 CH	Artificial Intelligence	4	1	70	30		3							100
CSE 418 CH	Database Systems	3	1	70	30		3							100
CSE 421 CH	Simulation of Engineering Systems	4	2	100	50		3							150
CSE 4xx EH	Elective Course (1)	3	1	70	30		3							100
CSE 413 CH	Computer Networks (2)							3	2	70	30		3	100
CSE 416 CH	Computer Peripherals							3	1	70	30		3	100
CSE 4xx EH	Elective Course (2)							3	1	70	30		3	100
CSE 4xx EH	Elective Course (3)							3	1	70	30		3	100
CSE 4xx EH	Elective Course (4)							3	1	70	30		3	100
		19	13					16	14					
Total Hrs /Week :		32						30						

Total Marks : **1500**

Faculty of Engineering

Table No : 26

Fourth Year **Electrical Engineering**

Computer and Systems (Systems)

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
CSE 401 CF	Electrical Testing		4		10				4	60	10	20	3	100
CSE 491 CF	Project	1	2					1	4			300		300
CSE 411 CH	Computer Interfacing	4	2	100	50		3							150
CSE 412 CH	Artificial Intelligence	4	1	70	30		3							100
CSE 418 CH	Database Systems	3	1	70	30		3							100
CSE 421 CH	Simulation of Engineering Systems	4	2	100	50		3							150
CSE 4xx EH	Elective Course (1)	3	1	70	30		3							100
CSE 423 CH	Advanced Industrial Control							3	1	70	30		3	100
CSE 425 CH	Industrial Control							3	2	70	30		3	100
CSE 4xx EH	Elective Course (2)							3	1	70	30		3	100
CSE 4xx EH	Elective Course (3)							3	1	70	30		3	100
CSE 4xx EH	Elective Course (4)							3	1	70	30		3	100
		19	13					16	14					1500
	Total Hrs /Week :	32						*Total Hrs /Week :*	30					*Total Marks :*

Faculty of Engineering

Table No : 27

First Year — **Mechanical Engineering**

General

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MDP 101 CF	Machine Drawing		3		25				3	100	25		3	150
PHM 114 CH	Mathematics (3)	4	2	100	50		3							150
PHM 123 CH	Physics (2)	2	2	60	20	20	3							100
CSE 120 CH	Numerical Computing Analysis	2	2	70	30		3							100
MDP 102 CH	Machine and Forming Technology (1)	4	4	100	25	25	3							150
MDP 103 CH	Engineering Materials (1)	2	2	60	20	20	3							100
HUM 1xx EH	Humanity Elective Course (1)	2	1	35	15		2							50
PHM 133 CH	Mechanics (2)							3	3	100	50		3	150
CES 119 CH	Theory of Structures							3	2	100	50		3	150
EPM 103 CH	Electrical Engineering							3	2	70	30		3	100
MDP 104 CH	Engineering Materials (2)							2	2	60	20	20	3	100
MEP 120 CH	Thermodynamics							4	2	100	50		3	150
HUM 111 CH	Technical Report Writing							2	1	35	15		2	50
	Total Hrs /Week :	16	16					17	15					*Total Marks :* 1500
		32						32						

Faculty of Engineering

Table No : 28

Second Year **Mechanical Engineering**

Production

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MDP 201 CF	Applied Mechanics (1)	2	2		25			2	2	100	25		4	150
MDP 202 CF	Machine Construction	2	2		25			2	2	100	25		4	150
PHM 213 CH	Mathematics (4)	4	2	100	50		3							150
MDP 204 CH	Elasticity and Plasticity	2	1	70	30		3							100
MDP 205 CH	Industrial Statistics	2	1	70	30		3							100
MDP 208 CH	Furnaces and Heat Treatment	1	1	70	30		3							100
MEP 224 CH	Heat Transfer	2	2	60	20	20	3							100
MEP 231 CH	Fluid Machinery	2	2	70	30		3							100
EPM 222 CH	Electrical Engineering (2)							3	3	100	50		3	150
MDP 203 CH	Metal Casting and Equipment							3	3	60	20	20	3	100
MDP 206 CH	Joining of Metals							2	1	70	30		3	100
MDP 207 CH	Mechanical Measuring Equipment							2	2	60	20	20	3	100
MEP 225 CH	Thermodynamics (2)							2	1	60	20	20	3	100
		17	13					16	14					Total Marks : 1500
	Total Hrs /Week :	30						30						

Faculty of Engineering

Table No : 29

Third Year **Mechanical Engineering**

Production

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MDP 301 CF	Applied Mechanics (2)	2	1		25			2	1	100	25		4	150
MDP 302 CF	Machine Design	2	2		25			2	2	100	25		4	150
MDP 303 CH	Metrological Measuring Equipment	2	2	60	20	20	3							100
MDP 304 CH	Machine Tools (1)	3	3	100	50		4							150
MDP 305 CH	Machining Technology (2)	3	2	100	25	25	3							150
MDP 306 CH	Theory of Metal Cutting	2	2	70	30		3							100
MDP 307 CH	Theory of Metal Forming	2	2	70	30		3							100
MDP 308 CH	Forming Machines							3	3	100	50		4	150
MDP 309 CH	Work Study							2	2	70	30		3	100
MDP 310 CH	Automatic Control							2	2	70	30		3	100
MDP 311 CH	Forming Technology (2)							3	2	100	25	25	3	150
MEP 325 CH	Refrigeration and Air Conditioning							2	2	70	30		3	100
		16	14					16	14					
Total Hrs /Week :		30						30					*Total Marks :*	1500

Faculty of Engineering

Table No : 30

Fourth Year **Mechanical Engineering**

Production

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MDP 401 CF	Project	4						4				200		200
MDP 4xx EF	Elective Course (1)	2			15			2		70	15		3	100
MDP 404 CH	Tools Design and Production Equipment	3	3	100	50		4							150
MDP 406 CH	Machine Tools (2)	4	4	120	40	40	4							200
MDP 411 CH	Industrial Legislation and Economics	3	2	70	30		3							100
MDP 4xx EH	Elective Course (2)	2	1	70	30		3							100
MDP 403 CH	Plant Layout							2	2	70	30		3	100
MDP 407 CH	Metrology							4	4	100	25	25	4	150
MDP 408 CH	Operations Management							4	2	70	30		4	100
MDP 409 CH	Operations Research	2	2	70	30		3							100
MDP 4xx EH	Elective Course (3)							2	2	70	30		3	100
MDP 4xx EH	Elective Course (4)							2	2	60	20	20	3	100
		20	12					20	12					
Total Hrs /Week :		32						32						*Total Marks :* 1500

Faculty of Engineering

Table No : 31

Second Year — Mechanical Engineering

Mechanical Power

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MEP 220 CF	Thermodynamics (2)	2	2	60	20		3	2	2	60	20	40	3	200
MEP 221 CF	Heat and Mass Transfer	3	2	60	20		3	2	2	60	20	40	3	200
MEP 222 CF	Fluid Dynamics	2	1		25			2	1	100	25		3	150
PHM 214 CH	Mathematics (4)	4	2	100	50		3							150
EPM 221 CH	Electrical Engineering	4	2	100	50		3							150
MDP 221 CH	Theory of Machines (1)	4	2	100	50		3							150
MDP 222 CH	Production Engineering							4	2	100	25	25	3	150
MDP 230 CH	Thermal and Mechanical Stresses							4	2	100	50		3	150
MDP 232 CH	Machine Construction (1)							4	2	100	50		3	150
HUM 2xx EH	Humanity Elective Course (2)							2	1	35	15		2	50
		19	11					20	12					
Total Hrs /Week :		30						*Total Hrs /Week :*	32					*Total Marks :* 1500

Faculty of Engineering

Table No : 32

Third Year **Mechanical Engineering**

Mechanical Power

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MEP 321 CF	Combustion	2	1	50	15		3	2	1	50	15	20	3	150
MEP 331 CF	Combustion Engines	2	2	60	20		3	2	2	60	20	40	3	200
MEP 332 CF	Fluid Machinery	3	2		15			2	2	100	10	25	3	150
MDP 322 CH	Theory of Machines (2)	4	2	100	50		3							150
MEP 320 CH	Measurements	2	4	80	35	35	3							150
MEP 330 CH	Thermal Plant	4	2	100	50		3							150
MEP 3xx EH	Elective Course (1)	1	1	50			2							50
EPM 330 CH	Electrical Power Engineering							4	2	100	50		3	150
MDP 333 CH	Machine Construction (2)							2	4	100	50		3	150
MEP 322 CH	Automatic Control							4	2	100	50		3	150
HUM 323 CH	Economics							2	1	35	15		2	50
		18	14					18	14					
Total Hrs /Week :		32						32						*Total Marks :* 1500

Faculty of Engineering

Table No : 33

Fourth Year — **Mechanical Engineering**

Mechanical Power

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MEP 430 CF	Energy Plant	3	2		20			3	2	120	20	40	4	200
MEP 432 CF	Fluid Machinery	3	2	60	20		3	3	2	60	20	40	3	200
MEP 433 CF	Refrigeration and Air Conditioning	3	2	60	20		3	3	2	60	20	40	3	200
MEP 436 CF	Project		2						2			200		200
MEP 431 CH	Combustion Engines	4	3	80	40	30	3							150
HUM 422 CH	Project Management	2	1	35	15		2							50
MEP 4xx EH	Elective Course (2)	2	1	70	30		3							100
MDP 431 CH	Industrial Organization							3	2	100	50		3	150
HUM 421 CH	Legislation and Contracts							2	1	35	15		2	50
MEP 4xx EH	Elective Course (3)							2	1	70	30		3	100
MEP 4xx EH	Elective Course (4)							2	1	70	30		3	100
		17	13					18	13					Total Marks : 1500
	Total Hrs /Week :	30						31						

Faculty of Engineering

Table No : 34

Second Year — **Mechanical Engineering**

Automotive

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
EPM 223 CF	Electrical and Electronic Engineering	2	1	50	25		2	2	1	50	25		2	150
MDP 233 CF	Machine Construction	2	2		40			2	2	120	40		4	200
MEA 235 CF	Automotive Technology	2	2	60	20		3	2	2	60	20	40	3	200
PHM 215 CH	Mathematics (4)	4	2	100	50		3							150
CES 210 CH	Stress Analysis	3	2	70	30		3							100
MEP 226 CH	Fluid Dynamics	2	2	60	20	20	2							100
MEP 227 CH	Thermal Engineering	4	2	100	25	25	3							150
MDP 223 CH	Production Engineering							2	2	60	20	20	3	100
MDP 234 CH	Applied Mechanics							4	3	100	50		3	150
MEA 241 CH	Automotive Engines							4	3	90	30	30	3	150
HUM 223 CH	Economics							2	1	35	15		2	50
		19	13					18	14					
Total Hrs /Week :		32						*Total Hrs /Week :*	32				*Total Marks :*	1500

Faculty of Engineering

Table No : 35

Third Year **Mechanical Engineering**

Automotive

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MDP 312 CF	Vibrations and Automatic Control	2	2	70	30		3	2	2	70	30		3	200
MEP 323 CH	Fluid Machinery	4	2	90	30	30	3							150
MEA 321 CH	Automotive Engineering (1)	4	4	140	60		4							200
MEA 331 CH	Automotive Design (1)	4	4	120	80		4							200
HUM 322 CH	Project Management	2	1	35	15		2							50
MEA 3xx EH	Elective Course (1)	2	1	30	20		2							50
EPM 310 CH	Automotive Electrical Equipment							4	2	100	50		3	150
MEA 311 CH	Car Measuring Instruments							2	2	60	20	20	2	100
MEA 332 CH	Automotive Design (2)							4	4	140	60		4	200
MEA 342 CH	Fuel Management							2	2	60	20	20	2	100
HUM 321 CH	Legislation and Contracts							2	1	35	15		2	50
MEA 3xx EH	Elective Course (2)							2	1	30	20		2	50
		18	14					18	14					
Total Hrs /Week :		32						32						
Total Marks :														1500

Faculty of Engineering

Table No : 36

Fourth Year **Mechanical Engineering**

Automotive

Course No.	Course Title	First Term						Second Term						Marks
		Hrs /Week		Marks			Exam Time	Hrs /Week		Marks			Exam Time	
		Lect	T/L	Final	Y. W.	Oral		Lect	T/L	Final	Y. W.	Oral		
MEA 422 CF	Automotive Engineering (2)	3	2	70	30		3	3	2	70	30		3	200
MEA 433 CF	Automotive Design (3)	2	2	60	40		3	2	2	60	40		3	200
MEA 450 CF	Project		4						4			200		200
MEA 413 CH	Vehicle Repair	2	2	60	20	20	2							100
MEA 414 CH	Maintenance Engineering	4	4	120	40	40	3							200
MEA 46x EH	Elective Course (3)	2	2	70	30		3							100
HUM 4xx EH	Humanity Elective Course (2)	2	1	35	15		2							50
MDP 432 CH	Industrial Organization							4	2	100	50		3	150
MEA 412 CH	Planning of Service Stations							2	2	70	30		3	100
MEA 434 CH	Vehicle Automatic Control Systems							2	2	70	30		3	100
MEA 46x EH	Elective Course (4)							2	2	70	30		2	100
		15	17					15	16					Total Marks : 1500
	Total Hrs /Week :	32						Total Hrs /Week : 31						

LIST OF ELECTIVE COURSES

1- Civil Engineering -Structure

Specialist Elective Course (1): Select one of the following Courses:

CES	313	EH	Computer Analysis of Structures
CES	321	EH	Special types of Concrete
CES	322	EH	New Civil Engineering Materials
CES	323	EH	Quality Control and Assurance
CES	324	EH	Inspection and Non Destructive Testing
CES	336	EH	Wall Bearing Structures
CES	337	EH	Construction Methods
CES	346	EH	Soil and Rocks in Dry Regions
CES	347	EH	Dynamic Soil Behavior
CES	353	EH	Cold Formed Steel Structures
CES	366	EH	Construction Equipment

Specialist Elective Courses (2), (3), (4): Select three of the following Courses:

CES	418	EH	Earthquake Engineering
CES	419	EH	High Rise Buildings
CES	421	EH	Repair and Strengthening of Structures
CES	422	EH	Polymers in Concrete
CES	423	EH	Fiber Concrete
CES	424	EH	Concrete Durability
CES	425	EH	Microstructure and Fracture Mechanics of Concrete
CES	438	EH	Advanced Analysis of R.C. Bridges
CES	439	EH	Reinforced Concrete Shell Roofs
CES	448	EH	In‹ Site Testing & Construction Technologies of Foundations
CES	449	EH	Ground Improvement
CES	453	EH	Modern Trends in Steel Brides
CES	454	EH	Behavior of Steel Structures
CES	455	EH	Design of Special Steel Structures
CES	456	EH	Plastic Design of Steel Structures
CES	457	EH	Fabrication Erection and Maintenance of Steel Structures
CES	467	EH	Management of Project Resources
CES	468	EH	System Analysis for Structural Engineering
CES	471	EH	Reliability and Fire Safety of R.C. Structures
CES	472	EH	High Rise Buildings and R.C. Towers
CES	481	EH	Soil-Structure Interaction
CES	482	EH	Tunnels and Underground Structures

2- Civil Engineering - Water and Hydraulic Structures

Specialist Elective Courses (1), (2), (3), (4): Select four of the following Courses:

CEI	470	EH	Engineering Hydrology
CEI	471	EH	Introduction to Water Resources System Analysis
CEI	472	EH	Ground Water Hydrology
CEI	473	EH	Computational Hydraulics

CEI	474	EH	Hydraulic Engineering
CEI	475	EH	Coastal Environment
CEI	476	EH	Computational Methods
CEI	477	EH	Hydrometry
CEI	478	EH	Hydraulic Modeling
CEI	479	EH	Tunnel Engineering
CEI	480	EH	Water Quality Measurements
CEI	481	EH	Basics of environmental Engineering
CEI	482	EH	Modern Irrigation Systems
CEI	483	EH	Inland Navigation
CEI	484	EH	Advanced Irrigation and Drainage
CEI	485	EH	Dam Engineering
CEI	486	EH	Water Resources Engineering
CEI	487	EH	Pumping Stations Engineering
CEI	488	EH	Ground Water Engineering
CEI	489	EH	History of Hydraulic Engineering
CEI	490	EH	Environmental Impact Assessment

3- Civil Engineering - Public Works

Specialist Elective Course (1): Select one of the following Courses:

CEP	410	EH	Geodetic Surveying
CEP	411	EH	The Earth Gravity Field
CEP	412	EH	Surveying With GPS

Specialist Elective Course (2): Select one of the following Courses:

CEP	460	EH	Sanitary Engineering (2)
CEP	462	EH	Industrial Waste Water
CEP	463	EH	Water Treatment For Industrial Purposes

Specialist Elective Courses (3), (4): Select two of the following Courses:

CEP	400	EH	Computer Application in Surveying
CEP	420	EH	Photogrammetry and Remote Sensing
CEP	421	EH	Geographic Information System GIS
CEP	433	EH	Construction Technology of Highways and Airports
CEP	434	EH	Maintenance of Highways and Airports
CEP	435	EH	Airport Engineering
CEP	436	EH	Highway Economics
CEP	437	EH	Traffic System Management
CEP	442	EH	Economic of Railway Construction and Maintenance
CEP	450	EH	Principles of Transportation Economics
CEP	451	EH	Planning and Management of Public Transport
CEP	452	EH	Traffic Impact Analysis
CEP	471	EH	Environmental Impact Studies
CEP	472	EH	Environmental Evaluation Studies
CEP	473	EH	Solid Wastes Management

4- Architecture Engineering - Architecture

Specialist Elective Courses (1), (2): Select two of the following Courses:

ARC	351	EH	Aesthetics in Architecture

ARC	352	EH	Advanced Computer Applications
ARC	353	EH	Interior Design
ARC	354	EH	Urban Design
ARC	355	EH	Urban Sociology
ARC	356	EH	Development of Rural Communities
ARC	357	EH	Architectural Rendering

Specialist Elective Courses (3), (4): Select two of the following Courses:

ARC	461	EH	Architectural Criticism and Project Evaluation
ARC	462	EH	Urban Renewal
ARC	463	EH	Housing in Developing Countries
ARC	464	EH	Local and Contemporary Architecture
ARC	465	EH	Advanced Technical Installations
ARC	466	EH	Urban and Architectural Heritage
ARC	467	EH	Environmental Design and Energy Conservation

5- Architecture Engineering - Urban Planning and Design

Specialist Elective Courses (1), (2): Select two of the following Courses:

UPL	391	EH	Housing Economy
UPL	392	EH	Environmental and Cultural Elements in Urban Development
UPL	393	EH	Environmental Planning
UPL	394	EH	Growth of Informal Squatter Areas
UPL	395	EH	New Communities And Settlements

Specialist Elective Courses (3), (4): Select two of the following Courses:

UPL	491	EH	Planning and Rural Development
UPL	492	EH	Urban Development in Developing Countries
UPL	493	EH	City Management
UPL	494	EH	informal Housing
UPL	495	EH	Regional Development and Planning

6- Electrical Engineering - Power and Electrical Machines

Specialist Elective Courses (1), (2), (3), (4): Select four of the following Courses:

EPM	415	EH	Generalized Theory Of Electrical Machines
EPM	416	EH	Special Electrical Machines
EPM	427	EH	Planning Of Electrical Networks
EPM	428	EH	Computer Applications In Power Systems
EPM	433	EH	High Voltage Applications
EPM	442	EH	Applications in Switchgear and Protection Systems
EPM	443	EH	Power System Protection
EPM	454	EH	Advanced Control Of Power Systems
EPM	462	EH	Applications in Power Electronics
EPM	463	EH	Electric Drives
EPM	464	EH	Power Electronics Systems Analysis
EPM	491	EH	Microprocessor Applications In Power Systems

ARC	352	EH	Advanced Computer Applications
ARC	353	EH	Interior Design
ARC	354	EH	Urban Design
ARC	355	EH	Urban Sociology
ARC	356	EH	Development of Rural Communities
ARC	357	EH	Architectural Rendering

Specialist Elective Courses (3), (4): Select two of the following Courses:

ARC	461	EH	Architectural Criticism and Project Evaluation
ARC	462	EH	Urban Renewal
ARC	463	EH	Housing in Developing Countries
ARC	464	EH	Local and Contemporary Architecture
ARC	465	EH	Advanced Technical Installations
ARC	466	EH	Urban and Architectural Heritage
ARC	467	EH	Environmental Design and Energy Conservation

5- Architecture Engineering - Urban Planning and Design

Specialist Elective Courses (1), (2): Select two of the following Courses:

UPL	391	EH	Housing Economy
UPL	392	EH	Environmental and Cultural Elements in Urban Development
UPL	393	EH	Environmental Planning
UPL	394	EH	Growth of Informal Squatter Areas
UPL	395	EH	New Communities And Settlements

Specialist Elective Courses (3), (4): Select two of the following Courses:

UPL	491	EH	Planning and Rural Development
UPL	492	EH	Urban Development in Developing Countries
UPL	493	EH	City Management
UPL	494	EH	informal Housing
UPL	495	EH	Regional Development and Planning

6- Electrical Engineering - Power and Electrical Machines

Specialist Elective Courses (1), (2), (3), (4): Select four of the following Courses:

EPM	415	EH	Generalized Theory Of Electrical Machines
EPM	416	EH	Special Electrical Machines
EPM	427	EH	Planning Of Electrical Networks
EPM	428	EH	Computer Applications In Power Systems
EPM	433	EH	High Voltage Applications
EPM	442	EH	Applications in Switchgear and Protection Systems
EPM	443	EH	Power System Protection
EPM	454	EH	Advanced Control Of Power Systems
EPM	462	EH	Applications in Power Electronics
EPM	463	EH	Electric Drives
EPM	464	EH	Power Electronics Systems Analysis
EPM	491	EH	Microprocessor Applications In Power Systems

7- Electrical Engineering - Electronics and Electrical Communication

Specialist Elective Courses (1), (2), (3), (4): Select four of the following Courses:

ECE	411	EH	Integrated Circuits Technology
ECE	412	EH	Analog Artificial Neural Networks
ECE	413	EH	Computer Aided Electronic Design and Manufacture
ECE	414	EH	Computer Interfacing Circuit Design
ECE	415	EH	Application Specific Integrated Circuits (ASICs)
ECE	416	EH	Analog Integrated Circuit Design
ECE	417	EH	Electronics for Instrumentation
ECE	418	EH	Integrated Optics
ECE	419	EH	Integrated Circuits Applications
ECE	491	EH	Digital Signal Processing
ECE	492	EH	Satellite Communications
ECE	493	EH	Mobile Communications
ECE	494	EH	Data Communications
ECE	495	EH	Personal Communications and Mobile Systems Antennas
ECE	496	EH	Radar Systems
ECE	497	EH	Optical Communication Systems
ECE	498	EH	Information Theory

8- Electrical Engineering - Computer and Systems (Computers)

Specialist Elective Courses (1), (2), (3), (4): Select four of the following Courses:

CSE	451	EH	Expert Systems
CSE	452	EH	Computer Graphics
CSE	455	EH	Neural Networks
CSE	456	EH	Operations Research and Management Systems
CSE	460	EH	Computer Security
CSE	461	EH	Machine Learning Systems
CSE	462	EH	Distributed Computer Systems
CSE	465	EH	Local Area Networks
CSE	467	EH	Computer Vision
CSE	469	EH	Selected Topics in Computers
CSE	476	EH	Robot Systems

9- Electrical Engineering - Computer and Systems (Systems)

Specialist Elective Courses (1), (2), (3), (4): Select four of the following Courses:

CSE	451	EH	Expert Systems
CSE	452	EH	Computer Graphics
CSE	455	EH	Neural Networks
CSE	456	EH	Operations Research and Management Systems

CSE	471	EH	Real-Time Systems
CSE	472	EH	Pattern Recognition Image Processing
CSE	473	EH	Special Control Circuits
CSE	474	EH	Intelligent Control Systems
CSE	475	EH	Biomedical Systems
CSE	476	EH	Robot Systems
CSE	479	EH	Selected Topics in Control

10- Mechanical Engineering - Production

Specialist Elective Course (1): Select one of the following Courses:

MDP	420	EH	Engineering Marketing
MDP	421	EH	Topics in Design and Production Engineering
MDP	422	EH	Computer Applications in Industry

Specialist Elective Course (2): Select one of the following Courses:

MDP	402	EH	Industrial Organization
MDP	411	EH	Industrial Project Management

Specialist Elective Courses (3), (4): Select two of the following Courses:

MDP	405	EH	Quality Control
MDP	410	EH	Quality Systems
MDP	412	EH	Total Quality Control
MDP	413	EH	Process Quality Control

11- Mechanical Engineering - Mechanical Power

Specialist Elective Course (1): Select one of the following Courses:

MEP	341	EH	Mechatronic
MEP	342	EH	Thermal Processes
MEP	343	EH	New and Renewable Energy

Specialist Elective Course (2), (3), (4): Select three of the following Courses:

MEP	440	EH	Control Applications In Thermal Engineering
MEP	441	EH	Control Applications In Fluid Machinery
MEP	442	EH	Control Applications In Refrigeration And Conditioning
MEP	443	EH	Computer Applications
MEP	444	EH	Control Of Fluid Power
MEP	445	EH	Pipe Line Networks

12- Mechanical Engineering - Automotive

Specialist Elective Courses (1), (2): Select two of the following Courses:

CEP	334	EH	Traffic Engineering
MEP	344	EH	Refrigeration and Air Conditioning
MEA	361	EH	Transport Economics
MEA	362	EH	Pollution From Vehicles
MEA	363	EH	Use of Natural Gas in Car Engines
MEA	364	EH	Pneumatic and Hydraulic Systems
MEA	365	EH	Vehicle Aerodynamics

Specialist Elective Courses (3), (4): Select two of the following Courses:

MEA	461	EH	Car Electronics
MEA	462	EH	Analysis of Car Accidents
MEA	463	EH	Heavy Vehicle Dynamics
MEA	464	EH	Vehicle Manufacture
MEA	465	EH	Earth Moving and Construction Equipment
MEA	466	EH	Material Handling Equipment
MEA	467	EH	Brake Systems

13- Humanities and Social Sciences (for all Students)

Humanity Elective Course (1): Select one of the following Courses:

HUM	x30	EH	Aesthetics
HUM	x31	EH	Literary Appreciation
HUM	x32	EH	Philosophic Thought
HUM	x33	EH	Scientific Thought

Humanity Elective Course (2): Select one of the following Courses:

HUM	x40	EH	Management and Marketing
HUM	x41	EH	Contemporary Economic Systems
HUM	x42	EH	Environment and Society Services
HUM	x43	EH	International Relations

COURSE SYLLABUSES

1- COURSES OFFERED BY THE DEPARTMENT OF ENGINEERING MATHEMATICS AND PHYSICS

PHM 010 CH MATHEMATICS (1)

Derivatives and techniques of differentiation — Derivatives of the trigonometric functions — The chain rule and implicit differentiation — Application of the derivative — Indefinite integrals and change of variables in it — The definite integral and its properties — The fundamental theorem of calculus — Applications of the definite integral — Differentiation and integration of transcendental functions — Indeterminate forms and L'hopital rule — Techniques of integration — Parametric equations and polar coordinates — Improper integrals.

PHM 011 CH MATHEMATICS (2)

Numerical integration — Partial differentiation — Complex numbers — Theory of algebraic equations — Numerical solution of algebraic and transcendental equations— Linear algebra — Conic sections — Solid analytical geometry.

PHM 020 CF Physics (1)

Properties of matter: Physical quantities, Units and dimension, Motion of rigid bodies, Oscillatory motions, Mechanical properties of matter, Mechanics of fluids — Electricity: The electric field and charges, Electrical potential, Capacitors and dielectric materials, Electric current, Kirchhoffs laws — Optics and heat: Light sources, Optical fibers, Characteristics of spherical surfaces, Lenses and mirrors, Heat transfer, First law of thermodynamics, Second law of thermodynamics, Applications — Electromagnetism: Magnetic field of current, Electromagnetic induction, Magnetic properties of matters, Alternating current, Solar energy and applications.

PHM 030 CF MECHANICS (1)

Vectors and applications; Statics: Forces, Momentum, Couples, Force system, Vector algebra — Equilibrium: Equilibrium of a particle, Equilibrium of rigid bodies, Joints and pulleys — Friction: Dry friction, Applications. Dynamics: Kinematics of a particle: Coordinate systems, Frames of reference, Rectilinear and curvilinear motion, Relative motion — Kinetics of a particle: Newton's law of motion, Uniform and variable acceleration, Equation of rectilinear motion, Separation of variables, Equations of curvilinear motion, Applications — Work and Energy of a particle: Work done by a force, Kinetic energy and work, General principle of work and energy, Conservative systems, Potential function, Conservation of energy — Impulse and Momentum: Linear and angular, Collision, Central field forces.

PHM 040 CH DESCRIPTIVE GEOMETRY

Biorthogonal projection: Representation of a point, Straight line and plane, Auxiliary projection, Position and metric problems, Polyhedrons and their representation, Plane sections and developments, The circle, Construction of the ellipse, The sphere and its plane section, The cone, Cylinder and conic sections, Surfaces of revolution and their intersections, The helix and helical surfaces — Orthogonal axonometry: The point, Straight line and plane, Position and metric problems, Polyhedrons, The circle, Sphere, Cone, Cylinder and helix.

PHM 050 CH ENGINEERING CHEMISTRY

Gaseous state — Thermo-chemistry — Liquid state — Solid state — Phase rule — Solutions — Solutions of electrolytes — Electrochemistry — Corrosion — Alloys — Nuclear chemistry — Water and water treatment — Pollution treatment — Cementing agents. Fuels — Combustion — Material and heat balance — Air pollution — High polymers. Selected chemical industries: Fertilizers, Polymers, Semiconductors.

PHM 110 CH MATHEMATICS (3)

Surface of second degree in space — Multiple integrals — First order differential equations — Infinite series and function expansions — Applications of partial derivatives: Extrema of functions of several variables — Expansion of function of several variables — Differential equations of higher orders, Homogeneous and non-homogeneous linear equations.

PHM 111 CH MATHEMATICS (4)

Simultaneous equations — Curvature: Basic concepts and definitions, Special curves — Fourier analysis: Periodic function and Euler formulas, Half range expansions — Numerical analysis and computer programming: Finite differences — Partial differential equations: Basic concepts and definitions, Rectangular and circular membranes — Probability and statistics: statistical analysis, Continuos probability distributions.

PHM 112 CH MATHEMATICS (3)

Surfaces of second degree in space — Multiple integrals: Surface integrals — Vector analysis: scalar and vector fields — First order differential equations: Infinite series and function expansions. Applications of partial derivatives: Extremes of functions of several variables.

PHM 113 CH MATHEMATICS (4)

Differential equations of higher orders: Homogeneous and non-homogeneous linear equations, Simultaneous equations — Curvature: basic concepts and definitions, Special curves. Fourier analysis: Periodic function and Euler formulas — Half range expansions. Numerical analysis and computer programming: finite differences — Partial differential equations: Basic concepts and definitions — Rectangular and circular membranes. Probability and statistics: statistical analysis, Continuous probability distributions.

PHM 114 CH MATHEMATICS (3)

Surface of second degree in space — Multiple integrals: First order differential equations. Infinite series and function expansions: Applications of partial derivatives, Extrema of functions of several variables, Expansion of function of several variables — Differential equations of higher orders: Homogeneous and non-homogeneous linear equations, Simultaneous equations — Curvature: Basic concepts and definitions, Special curves.

PHM 122 CF PHYSICS (2)

Vibrations and waves — Nonlinear oscillations — Physical optics — The quantum theory of radiation — Dual nature of light — Waves and particles. Modern physics: The crystalline state, Energy band structure of solids, Electrical phenomena in metals, Electronic in semiconductors. Applications in P.N. junction and lasers: X - ray and engineering applications, Radioactive materials and nuclear physics applications in electrical, Mechanical and civil engineering.

PHM 123 CH PHYSICS (2)

Vibrations — Waves — Nonlinear oscillations — Physical optics — The quantum theory of radiation — Dual nature of light — Waves and particles. Modern physics: Basic modern

concepts, quantum mechanics, contact phenomenon, Laser, Solid-state physics. Physics applications in mechanical engineering.

PHM 131 CH MECHANICS(2)

Centroids: Centroids for lines, Areas, Composite areas, Bodies — Moment of Inertia: Moment of inertia for areas, product of inertia, parallel axes theorem, Moments of composite areas, Moment of inertia about inclined axes, Mohr's circle — Hydrostatics: Pressure, Hydroststics forces, Floatation — Virtual Work: Virtual displacements, Principle of virtual work, Virtual work and potential energy.

PHM 132 CH MECHANICS (2)

Kinematics of rigid bodies: Types of motion, Rectilinear, Curvilinear, Pure rotation, General plane motion, Instantaneous center of rotation, Rolling without slipping — Kinetics of rigid bodies: Center of gravity, Moment of inertia for bodies, Forces, Equations of motion for rectilinear, Curvilinear, Pure rotation and general plane motion — Work-Energy Methods for rigid bodies: Work done by a force, Work for translational, Rotational and general motion, Kinetic energy, Principle of work and energy, Conservative field forces, Potential function, Conservation of energy.

PHM 133 CH MECHANICS (2)

Center of gravity and centroids: Basic definitions, Center of gravity, Center of mass — The Theory of Pappus and Guldinus — Moments and products of inertia: Planar areas, Moment of inertia for area, Product of inertia for area, Radius of gyration, Moment of composite areas, Moment of inertia for an area about inclined axes, Moments and products of inertia — Hydrostatics: Fluid properties and definitions, Hydrostatic pressure, Pressure at a point, Hydrostatic forces, Archimeds principle, Floatation, Stability, Vertical displacement, Rotational displacement — Kinematics of rigid bodies: Curvilinear motion, The Graphical Method, The analytical method, Rolling motion — Kinetics of rigid bodies: The Physical Significance of the equations of motion, Conservation of linear momentum, Equations of motion, Conservation of angular momentum, Rolling motion — Work-energy methods for rigid bodies: Concept of work, Kinetic energy, Work-energy principle, Field forces, Nonconservative field forces, The potential energy, Conservation of energy.

PHM 161 CH GEOLOGY

Basics of engineering geology — Rock types — Crystal movements — Folds — Faults and joints — Graphical representation of discontinuities — Rock weathering and soil formation — Ground water — Geological maps — Geological formations in Egypt.

PHM 210 CF MATHEMATICS (5)

Laplace transformation: Laplace transforms of elementary functions, Solution of partial differential equations. Series solution of differential equations: power series method, Series solution near ordinary and regular singular point — Special functions: Gamma and Beta functions, Error functions — Function of a complex variable: Analyticity and Cauchy-Remain conditions, Evaluation of real integrates — Probability and statistics: Discrete and continuous random variables, Testing of statistical hypotheses. Numerical analysis: Approximation by splines.

PHM 211 CF MATHEMATICS (5)

Laplace transformation: Laplace transforms of elementary functions, Solution of partial differential equations — Series solution of differential equations: Power series method, Series solution near ordinary and regular singular point — Special functions: Gamma and Beta functions, Error functions — Function of a complex variable: analyticity and Cauchy-Remain conditions, Evaluation of real integrals — Probability and statistics: Discrete and continuous

random variables, Testing of statistical hypotheses — Numerical analysis: Approximation by splines.

PHM 212 CF Mathematics (5)

Laplace transformation: Laplace transforms of elementary functions, Solution of partial differential equations — Series solution of differential equations: power series method, Series solution near ordinary and regular singular point — Special functions: gamma and beta functions, Error functions. Function of a complex variable: analyticity and Cauchy-Remain conditions, Evaluation of real integrals — Probability and statistics: Discrete and continuous random variables, Testing of statistical hypotheses — Numerical analysis: approximation by splines, Number systems and error analysis in computers — Discrete mathematics: algorithms, Boolean algebra, Pigeonhole principle, Recursive relations, Graph theory.

PHM 213 CH Mathematics (4)

Fourier analysis: Periodic functions and Euler formulas, Half range expansions — Numerical analysis and computer programming: Finite differences, Systems of equations and numerical integration — Probability and statistics: Statistical analysis, Continuous probability distributions — Partial differential equations: Basic concepts and definitions, Rectangular and circular membranes — Vector analysis: scalar and vector fields, Curvilinear coordinates.

PHM 214 CH Mathematics (4)

Fourier analysis: Periodic functions and Euler formulas, Half range expansions. Numerical analysis and computer programming: Finite differences, Systems of equations and numerical integration. Probability and statistics: Statistical analysis, Continuous probability distributions — Partial differential equations: Basic concepts and definitions, Rectangular and circular membranes — Vector analysis: scalar and vector fields, Curvilinear coordinates.

PHM 215 CH Mathematics (4)

Fourier analysis: Periodic functions and Euler formulas, Half range expansions — Numerical analysis and computer programming: Finite differences, Systems of equations and numerical integration — Probability and statistics: Statistical analysis, Continuous probability distributions — Partial differential equations: Basic concepts and definitions, Rectangular and circular membranes — Vector analysis: scalar and vector fields, Curvilinear coordinates.

PHM 310 CH APPLIED STATISTICS

Basic definitions: Frequency table, Ascending and descending, Measures of location, Measures of dispersion — Analysis of data of one variable: Basic definitions, Computing the measures of location, Computing the measures of dispersion — Analysis of data of more than one variable: Correlation analysis, Regression analysis.

PHM 334 CH DYNAMICS AND STABILITY

Introduction to the buckling phenomena — Experimental determination of buckling loads — Stability functions: Sway stability functions, General equations, Buckling modes and loads for frames. Trusses — Computer applications — Dynamic analysis of single-degree-of-freedom system — General equation of motion — Free damped and undamped vibrations — Constant, Triangular, and harmonic loading — Response to ground motion.

2- COURSES OFFERED BY THE DEPARTMENT OF STRUCTURE ENGINEERING

CES 100 CH THEORY OF STRUCTURES

General introduction to theory of structures — Loods — Forces — Reactions — Bending moments and shearing forces and Normal forces — Examples of statically determinate structures and their analysis — Stable and unstable structures — Internal stresses: Bending stress, Shear stress, Normal stress. Deformations of statically determinate beams.

CES 111 CF STRUCTURAL ANALYSIS (1)

Introduction to structural analysis — Types of loads — Supports and reactions — Stability and determinacy of structures — Internal forces for beams, trusses, frames, and arches — Influence lines of statically determinate beams, frames, and trusses — Cases of loading. Computer applications.

CES 119 CH THEORY OF STRUCTURES

Introduction to theory of structures — Loads and reactions — Normal forces, bending moments, and shearing forces for statically determinate structures — Stable and unstable structures — Internal stresses.

CES 120 CH PROPERTIES AND TESTING OF MATERIALS

Timber: Types and uses, Natural defects, Wood preparation, Chemical treatment — Methods of testing: Tension, Compression, Bending, Shear, Effect of humidity — Stones: Types, Preparation. Testing: Absorption test, Shrinkage, Compression, Bending, Chemical testing — Aggregates: Types and shapes, Standard sieves, Fine and coarse aggregates — Cement: Types of cements, Characteristics, Samples, Testing — Reinforcing steel: Types and testing of Bars — Reinforced concrete: Components, Water/Cement ratio, Curing, hardening, Testing — Brick: Types of brick, Characteristics, Testing of brick.

CES 121 CF PROPERTIES AND TESTING OF MATERIALS (1)

Building materials: Bricks, Building stones, Timber and gypsum — Concrete materials: Ordinary Portland cement and its types, Fine aggregates, Course aggregates, Mixing and curing water, Admixtures — Behavior of engineering materials under static loading: Unaxial compression, Bending, Shear, Torsion.

CES 200 CH CIVIL AND STRUCTURAL ENGINEERING

Measurements using tapes and Electronic equipment —Leveling — Level calculation: Longitudinal and cross sections — Angle measurements — Analysis of traverses — Introduction to the analysis of statically determinate structures — Foundations for reinforced concrete and Steel structures — Vibrations and dynamics in structures under heavy machinery operations.

CES 210 CH STRESS ANALYSIS

Definition of stress and strain — Relationship between stress and strain — Slope and deflection — Energy approach (Introduction to Finite Element Method) — Torsion — Combined Stresses — Mohr's Circle — Thin shell pressure vessels — Introduction of plasticity for cross sections.

CES 214 CF STRUCTURAL ANALYSIS (2)

Straining actions — Normal stresses in homogeneous elastic bodies — Normal stresses in heterogeneous and composite sections — Direct shear in bolts and rivets — Shear stresses due to bending and twisting moments — Combined stresses — Deformations of statically determinate structures — Virtual work method — Analysis of statically indeterminate

structures (Beams and frames) — Applications and techniques to solve statically indeterminate structures — Potential energy of structures — Euler theory in buckling.

CES 222 CH PROPERTIES AND TESTING OF MATERIALS (2)

Concrete technology — Properties and testing of fresh concrete — Properties and testing of hardened concrete — Concrete mix design methods — Inspection and non-destructive testing — Quality control and assurance — Behavior of engineering materials under different types of loading — Impacts — Fatigue — Creep — General topics: Welding, Hardness test, Non-destructive testing of metals and steel structures, Testing springs, Testing of ropes, Pipes and their testing.

CES 230 CF REINFORCED CONCRETE STRUCTURES

Reinforced concrete members: Beams, Cantilevers, Continuous beams, Frames, Arches — Types of reinforced concrete roofs: Domes, Vaults, Folded plate roofs, Shells, Principles of design for R.C. members — Introduction to pre-stressed concrete and its uses.

CES 232 CF REINFORCED CONCRETE DESIGN (1)

Fundamental physical and mechanical properties of concrete, Steel, and reinforced concrete. Structural systems of roofs — Loads and load distribution — Experimental behavior of R.C. structural elements — Flexure — Shear — Diagonal tension in beams using limit state design method. — Bond development in reinforcing bars — Short columns (Axially and eccentrically loaded columns) — Design of reinforced concrete beams — Design of one way slab — Serviceability of beams and one way slabs — Working stress design method

CES 240 CH FOUNDATIONS

Soil characteristics — Soil testing — Types of foundations: Isolated footings, Combined footings Wall footings, Raft foundations, Piles — Considerations in the design of each type of foundations and its suitability to the soil and loads.

CES 242 CH GEOTECHNICAL ENGINEERING (1)

Soil formation — Basic soil properties — Subsurface exploration and sampling — Hydraulic soil properties — Stress distribution within soil masses — Settlement and consolidation — Shear strength of soil — Field tests.

CES 250 CH STEEL STRUCTURES

Advantages of steel structures: Large spans, High- rise buildings, Allowable stresses in steel design — Considerations in the design of steel structures — Structural steel sections — Simple design of: Tension, Compression, Bending members — Welded and bolted connections — Safety regulations for steel buildings.

CES 310 CH STRUCTURAL ANALYSIS

Slope-deflection equations of equilibrium — Applications to continuous beams — Frames — Distribution factor — Carry over factor — Fixed end moment — Moment distribution method.

CES 311 CH STRUCTURAL ANALYSIS

Slope-deflection equations of equilibrium — Applications to continuous beams and frames — Distribution factors — Carry over factors — Fixed end moments — Moment distribution method.

CES 313 EH COMPUTER ANALYSIS OF STRUCTURES

Languages — Programming — Developing of computer programs for: Internal forces, Deflection of beams, Section properties, Normal stresses, Shear and Principal stresses.

CES 315 CF STRUCTURAL ANALYSIS (3)

Slope-deflection equations of equilibrium — Applications to continuous beams and frames — Distribution factors — Carry over factors — Fixed end moments — Moment distribution for beams and frames — Moment distribution under uniform and non-uniform rise of temperatures — Stiffness coefficients of in-plane prismatic members — Stiffness analysis of frames — Stiffness coefficients and analysis of grid systems — Stiffness analysis of space trusses — Computer programs of stiffness method.

CES 321 EH SPECIAL TYPES OF CONCRETE

Light weight and high density concrete — No fines concrete — Ready mixed concrete — Pre-placed aggregate concrete — High performance concrete — Cellular — Lunar and steam cured concrete — Under water concerning — Hot weather concerning.

CES 322 EH NEW CIVIL ENGINEERING MATERIALS

Types of new civil engineering materials — Process technology — Behavior and properties. Applications.

CES 323 EH QUALITY CONTROL AND ASSURANCE

Technical inspection — Quality control steps — Components of quality assurance — Conceptual basis for quality assurance schemes — Statistical control of concrete quality (software applications).

CES 324 EH INSPECTION AND NON DESTRUCTIVE TESTING

Fundamentals of inspection: Before construction, During construction, and After construction. Reporting (software application) — The purpose of non-destructive testing: Surface impact test, Surface absorption test, Permeability, and Hltrasonic pull — Maturity and radiographic test — Magnetic field and electric field methods — Stress coating.

CES 330 CF REINFORCED CONCRETE DESIGN (2)

Design of rectangular slabs — Design of hollow — block slabs — Paneled beams — Short and long columns — Columns under biaxial bending — Isolated and combined footings — Roofs: types and their uses.

CES 333 CF REINFORCED CONCRETE DESIGN (2)

Design of rectangular and circular solid slabs — Design of hollow — block slabs and paneled beams. Torsion in beams — Design of short and long columns. — Columns in biaxial bending — Isolated and combined footings — Roof sheds — Beams — Girders — Trusses — Arches and frames — Saw- tooth roofs — Joints in monolithic structures.

CES 336 EH WALL BEARING STRUCTURES

Properties of bricks — Masonry — Stones — Construction of wall bearing structures — Types of floors and roofs — Reinforced concrete masonry wall — Design and details of bearing structures: Buildings, Fences, and Arches.

CES 337 EH CONSTRUCTION METHODS

Different materials used in R.C. Structures — Introduction for systems of construction — Traditional systems: wall bearing, skeleton — Precast systems: construction method, Joints, Details — Tunnel forms: method, economy, and limitations — Plat Forms: method, economy and limitations. Lift slab.

CES 340 CH GEOTECHNICAL ENGINEERING (2)

Lateral earth pressure and conventional retaining walls — Bearing capacity of shallow foundations — Ground improvement — Soil compaction — Seepage and dewatering.

CES 343 CH GEOTECHNICAL ENGINEERING (2)

Lateral earth pressure and conventional retaining walls — Bearing capacity of shallow foundations — Ground improvement — Soil compaction — Seepage and dewatering — Stability of slopes — Soils in arid regions — Fundamentals.

CES 344 CH FOUNDATION ENGINEERING (1)

Analysis of shallow foundations — Wall footings — Isolated footings — Combined footings — Strap beams — Raft foundations — Deep foundations — Types of deep foundations — Classification of piles — Capacity of a single pile — Pile load test — Capacity of pile groups — Settlement of pile foundation — Design of pile caps.

CES 346 EH SOIL AND ROCKS IN DRY REGIONS

Nature — Origin and occurrence of expansive soils — Factors affecting the swelling and shrinkage of soil — Mineralogy — Identification — Classification and heave prediction — Design and construction of foundation and remedial measures — Distribution of swelling soils in Egypt — Collapsible soils: Nature, Origin and occurrence, Identification, Sampling and testing — Settlement prediction and remedial measures — Distribution of collapsible soils in Egypt — Rock mechanics: Rock substance and mass, Site investigation for rocks, Lab. testing of rocks, Engineering classification of rocks, Description of geological discontinuities, Foundations on rock formations.

CES 347 EH DYNAMIC SOIL BEHAVIOR

Vibration of elementary systems — Wave propagation in soil deposits — Dynamic stress — Deformation and strength characteristics of soils in- site — Laboratory measurements of dynamic soil properties.

CES 348 CH GEOTECHNICAL AND FOUNDATION ENGINEERING

Lateral earth pressure and conventional retaining walls — Bearing capacity of shallow foundations — Soil improvement — Compaction — Seepage and dewatering — Soil in arid regions — Analysis of shallow foundations — Wall footings — Isolated footings — Combined footings — Strap beams — Raft foundations — Types of deep foundations — Classification of piles.

CES 349 CH FOUNDATION ENGINEERING (1)

Analysis of shallow foundations — Wall footings — Isolated and combined footings — Strap beams — Raft foundations — Deep foundations and their types — Classification of piles — Capacity of a single pile — Pile-load test — Capacity of pile groups.

CES 350 CH STRUCTURAL STEEL DESIGN (1)

Introduction to properties and shapes of steel sections — Principles of design in steel structures — Loads — Structural systems and their lateral resistance — Welded and bolted connections — Design of tension and compression members — Design of beams and columns.

CES 351 CH STRUCTURAL STEEL DESIGN

Properties of steel and introduction to steel structures — Principles of design — Loads — Structural systems and resistance to horizontal forces — Bolted and welded connections — Design of tension members — Compression members — Buckling of compression members — Design of beams — Local and lateral buckling of beams — Design of beam-columns — Moment magnification factor — Built-up sections — Design of plate girders — Design of composite beams — Estimating cost of steel structures.

CES 353 EH COLD FORMED STEEL STRUCTURES

Introduction to the shapes and properties of cold-formed sections — Design criteria used in cold-formed steel — Design of beams with stiffened and unstiffened compression flanges — Design of compression members and the effect of local buckling — Design of Beams, Columns, and Cylindrical tubular members and connections.

CES 366 EH CONSTRUCTION EQUIPMENT

Major mechanical operations in construction — Earth moving equipment — Hoisting equipment: (Cranes), Conveying, Pumping, Batch plants, Pile driving — Planning and selection of construction equipment — Production Estimates — Sizing and matching — Economies of construction equipment — Preventive maintenance and repair — Systems approach to planning and applications.

CES 417 CH ADVANCED STRUCTURAL ANALYSIS

Analysis of rectangular plates — Cylindrical shell roofs — Spherical domes — Double curved shells — Upper and lower bound theorems — Limit analysis of beams — Limit analysis of frames — Interaction diagrams.

CES 418 EH EARTHQUAKE ENGINEERING

Characteristics of earthquakes — Earthquake risks in Egypt — Response of a single degree of freedom system to various dynamic loading — Time-domain analysis — Response spectra — Design codes — Computer applications.

CES 419 EH HIGH-RISE BUILDINGS

Types of tall buildings — Loads — Rigid frame buildings — Shear walls — Vierendeel structures — Loads on chimneys — Approximate static analysis — Approximate dynamic analysis — Loads on transmission towers — Approximate analysis of transmission towers.

CES 421 EH REPAIR AND STRENGTHENING OF STRUCTURES

Causes of defects — Evaluation of structures — Materials for repair and strengthening — Repair methods — Strengthening methods.

CES 422 EH POLYMERS IN CONCRETE

Monomers and polymers — Polymer impregnated concrete — Polymer Portland concrete — Polymer concrete: Process technology, Properties, Design, And applications.

CES 423 EH FIBER CONCRETE

Types of fibers — Properties — Theoretical principles of fiber inclusion — Steel fiber concrete properties in fresh state and hardened state — Polypropylene fibers in concrete — Glass fibers in concrete — Applications.

CES 424 EH CONCRETE DURABILITY

Permeability of concrete — Effect of weathering on concrete — Effect of sea water and carbonation — Sulfate attack on concrete — Freezing and thawing resistance of concrete — Corrosion of steel in reinforced concrete in marine environment — Abrasion resistance and fire resistance of concrete.

CES 425 EH MICROSTRUCTURE AND FRACTURE MECHANICS OF CONCRETE

Different phases in hydrated cement paste — Microstructure development: Aggregate, Paste interface, Overall concrete macrostructure — Effect of low W/C ratio and SCM on concrete microstructure — Traditional fracture mechanics fundamentals: Fracture mechanics analysis

using finite element programs, Fracture of brittle materials, Experimental evaluation of fracture properties.

CES 430 CF REINFORCED CONCRETE

Analysis and design of folded plates: slab and beam actions — Edge shear and end diaphragms — Yield line theory — Crack propagation pattern — Virtual work — Application to rectangular and irregular slabs — Serviceability limit state — Crack control — Design of water sections: Systems, Types and Shapes of water tanks — Open channels — Medium and deep tanks.

CES 434 CF REINFORCED CONCRETE DESIGN (3)

Design of flat slabs — Seismic design — Surfaces of revolution (Domes, Cones, ...) — Analysis and design of folded plates — Slab action — Beam action — Edge shear — End diaphragm — Detailing — Yield line theory — Crack propagation patterns — Virtual work analysis — Application to rectangular and irregular slabs — Limitations — Design and detailing — Pre-stressed concrete — Statically indeterminate structures — Primary and secondary internal forces — Cable layout — Design of end-block — Limit design — Detailing — Introduction to reinforced concrete bridges — Static system — Loads — Types (Slab, Girder and Box girder types) — Design and detailing.

CES 435 CH REINFORCED CONCRETE DESIGN (4)

Serviceability Limit State — Crack control — Design of water sections — Static action — Loads and load distribution — Method of sections — Systems — Types and shapes of water tanks — Open channels — Medium and deep tanks — Elevated tanks — Rested on ground and underground tanks — Detailing — Special topics: Design and detailing of deep beams, Circular slabs and beams, Special systems of water structures.

CES 436 CF REINFORCED CONCRETE DESIGN (3)

Design of flat slabs — Seismic design — Surfaces of revolution (Domes, Cones, ...) — Analysis and design of folded plate roofs — Slab and beam actions — Edge shear and end diaphragms — Detailing. Yield line theory — Crack propagation — Virtual work and its application to rectangular and irregular slabs — Limitations — Pre-stressed concrete: Primary and secondary internal forces, Cable layout, Design of end block — Limit design — Detailing — Introduction to R.C. Bridges: Static systems, Types, Their design and detailing.

CES 438 EH ADVANCED ANALYSIS OF R.C. BRIDGES

Types of bridges — Design specification related to different codes. Loads — Revision of slab — girder and box-girder reinforced and pre-stressed bridges — Advanced systems of reinforced and pre-stressed bridges: Segmental, Cantilever, Cable and stayed, Suspension, and Arch bridges — Bearing and joints — Substructures: Construction and maintenance.

CES 439 EH REINFORCED CONCRETE SHELL ROOFS

Surfaces of revolution (domes and cones) — Cylindrical shells — Folded plates — Membrane analysis: Elliptical paraboloid, Hyperbolic paraboloid, conoid — Bending theory.

CES 440 CH FOUNDATION ENGINEERING (2)

Settlement of pile foundations — Design of pile caps — Classification of earth retaining walls — Analysis of retaining walls — Cantilever walls — Walls with one support — Overall block stability — Fundamentals of soil-structure-interaction.

CES 445 CH FOUNDATION ENGINEERING (2)

Classification of earth retaining structures — Analysis of non-conventional retaining walls — Cantilever walls — Wall, with one support — Overall block stability — Soil-structure

interaction-Fundamentals — Tunnels and underground structures — Cofferdams: Classification, Bracing systems, Base stability, Design of cofferdams.

CES 448 EH IN-SITE TESTING & CONSTRUCTION TECHNOLOGIES OF FOUNDATIONS

Geotechnical in-site test — Construction technologies of piles — Construction technologies of in- site walls — Construction of foundations for bridges — Underpinning of structures — Interaction between design and construction of foundation systems.

CES 449 EH GROUND IMPROVEMENT

Factors affecting soil improvement — Mechanical stabilization (Densification) — Drainage — Grouting — Soil reinforcement — Ground freezing — Criteria for choosing suitable technique for soil improvement.

CES 450 CF DESIGN OF STEEL STRUCTURES

Plate girders and built-up sections — Cost estimate for steel buildings — Types of steel bridges — Design of floor beams in highway and railway bridges — Horizontal and vertical bracing — Main girders, and design of movable and fixed bearings.

CES 452 CF DESIGN OF STEEL BRIDGES

Floor systems for railway and highway bridges — Special bracing for railway bridges — Stringer and braking force bracing systems — Composite steel-concrete bridges: Design and Construction — Truss bridges: Geometry, Design of members, Stability of compression chord, Design of joints and gusset plates in welded and bolted (riveted) trusses, bracing for truss bridges and portal frames— Deflection and camber for plate girder and truss bridges — Beam grids — Application to Highway Bridge with more than two main girders.

CES 453 EH MODERN TRENDS IN STEEL BRIDGES

Introduction to modern trends in steel bridges — Orthotropic plate floor — Steel plate floor for railway bridges — Box girder bridges: Dimensioning, Static calculations, Application of grid action to box girder bridges, Composite box girders — Cable stayed bridges — Suspension bridges.

CES 454 EH BEHAVIOR OF STEEL STRUCTURES

Behavior of structural steel: Properties, Brittle fracture, Fatigue of structural metals — Structural fasteners: Rivets high strength bolts, Nuts, Washers, Welds — Structural connections — Structural steel beams: Static behavior, Fatigue behavior — Behavior of structures.

CES 455 EH DESIGN OF SPECIAL STEEL STRUCTURES

Analysis and design of Steel tanks — Space structures — Transmission towers — Suspended roofs — Soil structures — High- rise buildings.

CES 456 EH PLASTIC DESIGN OF STEEL STRUCTURES

Introduction to plastic analysis — Flexure in beams — Analysis of structures for ultimate loads — Secondary design problems — Continuous beams — Steel frame design.

CES 457 EH FABRICATION, ERECTION AND MAINTENANCE OF STEEL STRUCTURES

Fabrication — Shop detail drawings — Flame cutting — Shearing and sawing — Punching — Drilling and welding — Erection: Erection equipment, Erection methods for buildings and bridges, Field tolerances — Painting: Painting materials adhesive materials, Additives (curing) materials, Filling materials — Choice of appropriate painting for steel structures

according to surrounding media. Tests required for painting materials — Maintenance: corrosion of steel — nature of metal and surrounding media (Air — Water and/or Soil) — Effect of surrounding media on corrosion rate of steel structures— Curing of steel structures.

CES 459 CH STEEL STRUCTURES (2)

Design of plate girders — Design of built-up sections — Cost estimate of steel structures — Types of steel bridges — Design of floor beams in highway and railway bridges.

CES 467 EH MANAGEMENT OF PROJECT RESOURCES

Material management : planning and control, Information system, Procurement and acquisition — Cost — Human resources management: Team organization, Manpower planning recruiting, Selection and training — Incentives — Site management: Site layout, Facilities and services, Communications, Reporting.

CES 468 EH SYSTEMS ANALYSIS FOR STRUCTURAL ENGINEERING

The systems Analysis approach — Multi objective approach — Establishing an appropriate objective function — Mathematical model types — Resource allocation and mathematical models — Optimization methods — Decision analysis — Fundamental considerations in project planning — Perfect and imperfect information.

CES 471 EH RELIABILITY AND FIRE SAFETY OF R.C. STRUCTURES

Statistical analysis of different R.C. structures: Mean value, Standard deviation, Coefficient of variant — Methods for calculating the variability of R.C. structural element: Monte Carol analysis, Tailor's series expansion — Probability of failure of R.C. structures: Direct method for the evaluation of failure probability, Failure probability of indeterminate structures — Fire design of concrete and composite structure: Principles of structural fire design, Material failure criteria, Assessment method, Structural detailing by tabulated data, Ultimate capacity of structural members under fire exposure, Judgment of the degree of deterioration and method of repair.

CES 472 EH High Rise Buildings and R.C. Towers

Common high- rise buildings and basic structural elements — Linear surface elements — Façade, envelope, and core — Analysis of high- rise buildings — Portal method cantilever method — Plane frame analysis — Shear wall and shear wall frame analysis — Perforated core analysis — Finite element analysis — Effect of wind and earthquake on high- rise building — Comparison of high- rise structural systems.

CES 481 EH SOIL-STRUCTURE INTERACTION

Distribution of stresses in soil mass — Modeling of soil — Analysis and distribution of contact pressure in circular, strip, and rectangular foundations — Design of raft foundations — Analysis of foundations for tall buildings.

CES 482 EH TUNNELS AND UNDERGROUND STRUCTURES

Classification of tunnels — Tunneling and pipe jacking — Analysis and design of tunnel lining — Ground settlement due to tunneling — Geotechnical instrumentation — Analysis and design of culverts — Subway stations and other underground structures.

CES 491 CH PLANNING AND CONTROL FOR CONSTRUCTION PROJECTS

Introduction to the main goals and systems approach for the construction industry — Modeling the planning and control operations — Breakdown of project activities to suit

project stages and users needs — Planning and scheduling tools: Bar charts, Progress curves, Line of balance and networks, Critical path and pert procedure. Resource allocation — Leveling and smoothing — Quality, time and cost control techniques — Optimal schedules — Linear programming and computer applications.

CES 492 CH CIVIL PROJECT MANAGEMENT

Introduction to basic management — Main goals and life cycle — Definition of project as part of strategic plans — Project stages — Aspects to consider: Purpose, Activities and participants. The role of quality at different project stages— Contract management: Legal and contractual aspects, Logistic of owner and contractor organization, Duties, Responsibilities and authority — Introduction to basic principles to estimates of cost and factors involved — Application in implementation of civil projects.

CES 499 CH PROJECT

Each student selects one area of the following subjects to perform his graduation project: Reinforced Concrete Structures, Steel Structures, Foundation Engineering, Properties and Testing of Materials, or Structural Analysis.

3- COURSES OFFERED BY THE DEPARTMENT OF IRRIGATION AND HYDRAULICS

CEI 121 CH FLUID MECHANICS

Fundamentals: Development and scope of fluid mechanics, Physical characteristics of the fluid state, Units, density, Specific weight, Specific volume, Specific gravity, Compressibility, Elasticity, Viscosity, Surface Tension, Capillary and vapor pressure — Fluid statics : Pressure-density-height relationships, Absolute and gage pressures — Manometers — Forces on submerged plane surfaces — Forces on submerged curved surfaces — Kinematics of fluid motion: Steady and unsteady flow, Streamlines and stream-tubes, one, two, and three dimensional flows — Equation of continuity — One dimensional steady flow — Flow of an incompressible ideal fluid: One dimensional flow, Euler equation, Bernoulli equation — The work energy equation — The one dimensional assumption for stream-tubes of fine cross section — Application of bernoulli equation — The impulse-momentum principle: Development of the principal for control volumes, elementary applications.

CEI 131 CH CIVIL ENGINEERING DRAWING

Metallic sheds: Column base, Riveted joints, Connections between girders and beams, Columns and beams — Steel bridges: Truss Connections, Main girders (upper and lower chords, vertical and diagonals), Cross girders and stringers — Reinforced concrete structures: Footings, Slabs, Columns and beams — Irrigation structures: Earth works, Retaining walls, Bridges, Weirs, Culverts, Siphons, Regulators, Symmetrical and unsymmetrical locks.

CEI 221 CH FLUID MECHANICS (1)

Development of fluid mechanics — Physical characteristics of fluid state — Properties of fluids— Fluid statics — Flow of Fluid — Equation of a streamline — Types of fluid flow — Adiabatic flow — Control volume — Control Surface — Continuity Equation — Velocity and Acceleration of Flowing Fluids — Basic principles on non-viscous fluids: Forces acting in fluid flow, Euler equation of motion along a streamline, Euler Equation in Three Dimensions, Bernoulli Equation — Steady Flow: Energy Equation — The total energy line and hydraulic gradient line — Applications to bernoulli equation — Time of emptying of a tank — Pitot tubes — Flow over weirs and notches — vortex motion: Differential equation of vortex motion, Free vortex, forced vortex — Equation of linear momentum: Applications to

the momentum equation, Flow through pipes: Laminar and turbulent flow, Reynolds' number, Energy lost through a pipe of constant diameter, Laminar flow in circular pipes, Equation of discharge, Darcy equation, Velocity distribution for laminar and turbulent flow, Smooth and rough pipes — Absolute roughness and relative roughness of pipes — Resistance of commercial pipes — Minor losses in pipes — Hydraulic gradient and total energy line and power delivered by a pipe.

CEI 222 CH HYDRAULICS

Flow in pipes and closed conduits: Design of a simple pipe system, In- series, In- parallel and branched pipe systems, Distributed systems, pressure surge in pipelines — Open channel flow: Flow with a free surface, Flow classification, Open channels and their properties, Steady uniform flow, Design of open channels, Velocity distribution, Energy and momentum coefficients — Rapidly varied flow: the use of energy principles and the use of momentum principles — Water pumps: Classification of pumps, Performance data for pumps, Pump selection, Cavitation in pumps — Dimensional analysis and hydraulic model testing: Dimensional homogeneity and its implications, Dimensional analysis, Dimensional analysis involving more variables (Buckingham theory) — Similarity, Applications of dynamic similarity, Hydraulic models.

CEI 225 CH HYDRAULICS

Flow through pipes: Laminar and turbulent flow, Reynolds number, Energy lost through a pipe of constant diameter, Laminar flow in circular pipes — Equation of discharge — Turbulent flow — Darcy's equation, Velocity distribution for laminar and turbulent flow, Smooth and rough pipes, Variation of coefficient of friction with reynolds' number — Absolute roughness and relative roughness of pipes, Resistance of commercial pipes — Minor losses in pipes, Hydraulic gradient and total energy line, Power delivered by a pipe — Hydraulic machines: Classification of machines, Pumps, Performance data for pumps, Pump selection, Performance data for turbines, Turbine selection, Cavitation in hydraulic machines.

CEI 241 CH IRRIGATION AND DRAINAGE

Introduction — Soil-water relationship: soil formations, Porosity, Kinds of densities, moisture content — Soil fertility, Infiltration rate, Soil salinity — Quality of irrigation water, Effects of salt on soils, Leaching requirement — Water requirement: Application rates, Consumptive use, Irrigation efficiency, Water duty — Irrigation methods: Surface irrigation methods, Spray and sprinkler methods, Drip irrigation, Developed irrigation methods — Irrigation system in Egypt: History of irrigation, Flood irrigation, Perennial irrigation, Irrigation network — Drainage: Introduction, Surface drainage, Tile drainage, Vertical drainage.

CEI 301 CH ENVIRONMENTAL HYDRAULICS

Flow in pipes and closed conduits: Design of a simple pipe system, Series, Parallel and Branched pipe systems, Distributed systems, Pressure surge in pipelines — Open channel flow: Flow with a free surface, Flow classification, Open channels and their properties, Steady uniform flow — Design of open channels, Velocity distribution, Energy and momentum coefficients — Rapidly varied flow: The use of energy principles and the use of momentum principles, gradually varied flow — Hydraulic machines: Classification of machines, Pumps, Performance data for pumps, Pump selection, and Performance data for turbines, Turbine selection, Cavitation in hydraulic machines — Hydraulic similitude and modeling: Dimensional theories, The idea of "similarity", Applications of dynamic similarity, Hydraulic models — Water quality modeling: Dispersion processes, Dispersion in a one-dimensional stream, Two-dimensional modeling, Differential density effect, Buoyant jets, Intrusion due to density currents.

CEI 302 CH ENVIRONMENTAL HYDROLOGY

Introduction: Hydrological cycle, Effect of man on hydrological cycle, Acid rain, Relation between meteorology and hydrology — Meteorology: Solar energy, Temperature, Vapor pressure, Humidity, Wind, Evaporation, Rainfall, Rainfall analysis — Runoff: Rainfall-Runoff relation, Floods, Flood water level recording, Flood flow measurement, Duration curves, Mass curves unit hydro-graph — Groundwater hydrology: Saturated and unsaturated soils, Fluid flow through porous media, Kinds of aquifers, Hydraulics of wells, Kinds of wells and their drilling, Salt water intrusion, Groundwater reservoirs in Egypt — Nile hydrology: Nile water and projects, Environmental effects, Water resources protection.

CEI 303 CF IRRIGATION DESIGN (1)

Alignment of canals and drains — Synoptic diagram of water ways — Design of canal and drain cross sections — Longitudinal section of canals and drains and typical cross sections — Introduction to various types of works needed in water projects — Various types of roadway crossings with water ways — Small span bridges of various types: Arches, R.C.,
Steel — And culverts — Design of various bridge elements including piers and abutments — Water way crossings — Siphons and aqueducts — Environmental impacts of irrigation and drainage projects.

CEI 331 CH IRRIGATION DESIGN

Component parts of empirical design and hydraulic design of the following structures: Retaining walls — Roadway crossing waterways: R.C. bridges, Culverts — Waterway crossings: Siphons, Aqueducts — Heading-up structures: Percolation, Uplift, and Scour theories, Weirs, Regulators, Earth embankments

CEI 332 CH HYDRAULICS (2)

Flow in pipes and closed conduits: Design of a simple pipe system, Series, Parallel and branched pipe systems, Distributed systems, Pressure surge in pipelines — Open channel flow: Flow with a free surface, Flow classification, Open channels and their properties, Steady uniform flow, Design of open channels, Velocity distribution, Energy and momentum coefficients — Rapidly varied flow: The use of energy principles and the use of momentum principles, Gradually varied flow — Hydraulic similitude and modeling: Dimensional theories, Similarity, Applications of dynamic similarity, And hydraulic models.

CEI 353 CH IRRIGATION DESIGN

Alignment of canals and drains — Synoptic diagram of waterways — Design of canal and drain cross sections — Longitudinal section of canals and drains and typical cross sections — Introduction to various types of works needed in water projects — Various types of roadway crossings with waterways — Small span bridges of various types: Arches, R.C., Steel, and Culverts — Design of various bridge elements including piers and abutments — Water way crossings — Siphons and aqueducts — Environmental impacts of irrigation and drainage projects.

CEI 401 CF HARBOR ENGINEERING AND NAVIGATION

Natural phenomena: Wind, Tides, Sea currents, Waves — Harbor planning: Planning, Functioning— Breakwater alignment — Planning of different items of harbor (Navigation channel — Entrance — Protected water area — Quays) — Service buildings — Harbor master-plan — Breakwater (rubble mound breakwaters — wall breakwater — concrete blocks breakwater — Caisson breakwater — Mixed breakwater) — Quay walls — Dry docks — Slip ways — Ship lifts — Sheds — Navigation: Kinds of navigation channels, Hydraulic phenomena, Accompanying ships passing through navigation channel, Behavior of ships in restricted waterways, Design of navigation channels, Protection of navigation channels.

CEI 403 CF DESIGN OF IRRIGATION WORKS

Heading up structures: Weirs: Weir functions, Hydraulics of weirs, Static design of the floor — Regulators and barrages: Types of regulators, Component parts of the regulators, Design of waterway, Flow of water through sluice vents — Static design of the Piers, Floor, Gates and Winch structure — Navigation structures: Symmetrical and unsymmetrical locks: the main elements of locks, The usual dimensions of lock chambers, The empirical dimensions of P.C. locks, Methods of emptying and filling the lock chamber, Determination of area of culverts, Statistical design of locks (Landing wall, Guide pier, Thrust wall and floor) — Storage structures: reservoirs: Selection of site for reservoir, Types of reservoirs and zones of storage, Investigation, Reservoir losses, Sedimentation in reservoirs, Life of a reservoir — Dams: Selection of a dam site, Types of dams, Selection of a suitable type of dam, Forces acting on dams, Earth dams, Rockfill dams, Gravity dams, Buttress dams, Arch dams.

CEI 450 CH PROJECT

Project in one of the following fields: Design of irrigation works, Harbor navigation and shore protection, Ground water, Water power, Water lifting stations, Hydraulics, Protection against floods, Irrigation systems, Land reclamation, Control of environmental pollution.

CEI 476 EH COMPUTATIONAL METHODS

Introduction — The general Navier- Stock equations, Various forms of the Navier-Stocks equations, the Navier-Stock equations for incompressible flow — Finite-Difference methods: Discrete approximations, Solution of an ordinary differential equation, Analytical solution of the finite Difference problem — Upwind corrected schemes — Higher Order methods — Solution of a one dimensional linear parabolic equation — Solution of one - dimensional nonlinear parabolic and hyperbolic equations — Multidimensional equations — Finite Difference solutions of the Navier-Stock equations: The Navier-Stock equations in primitive variables, Steady Navier-Stock equations The unsteady Navier-Stock equations — Example for solving primitive variable formulation — The stream function vorticity: formulation and solution approaches — Example solutions for stream function vorticity formulation.

CEI 477 EH HYDROMETRY

Introduction — Field measurements, International standards in stream gauging, Selection of method — The velocity — Area method of stream-flow measurements — Measurement of stage — The stage discharge relation — Special problems in stream-flow measurements — Measurements by floats — Slope — Area method of stream-flow measurement — Weirs and flumes: principles and theory — Measurement of head, Field calibration, Measuring structures, Dilution gauging — The moving boat method of stream-flow measurement — Ultrasonic method of stream-flow measurement — The electromagnetic method — Accuracy — Processing discharge records.

CEI 475 EH COASTAL ENVIRONMENT

Coastal issues and physical processes — Wave hydrodynamics — Shoreline morpho-dynamics — Tides and lakes — Long — Term development of coasts — Effect of sea — Level change on shorelines — Beach ecosystems — Coastal dunes — Coastal wetlands — Man activities and the coast — Coastal water management — Management of coastal lands and sediments — Management of coastal ecosystems — Coastal hazards.

CEI 473 EH COMPUTATIONAL HYDRAULICS

Discrete forms of conservation laws: Conservation Laws and equations, Galilean frames, Mass, Momentum and energy levels in relation to mass — Momentum and energy flux densities — Some worked examples — Continuous forms of conservation laws: One-Dimensional primitive forms for vertically homogeneous fluids — Expansions and

contractions in One-Dimensional flows — Two- Dimensional conservation forms for homogeneous fluids — Eulerian forms and algorithmic forms — Eulerian forms of Boussinesq equations. The method of characteristics: Characteristics and inveriants, Regions of state, Formation and computation of the hydraulic jump, Indeterminacy conditions for the method of characteristics — Numerical Methods: The three Point method of characteristics, The four-point method of characteristics — Explicit and Implicit difference methods for one-Dimensional nearly horizontal flows — An implicit difference method for a Boussinesq equation.

CEI 470 EH ENGINEERING HYDROLOGY

Review of the hydrologic cycle — Hydrologic data — Statistical analysis for hydrologic data and its interpretation — Selection of design parameters from data — The unit hydro-graph — Probability and flood expectation from rainfall data — Flood protection works and groundwater utilization

CEI 471 EH INTRODUCTION TO WATER RESOURCE SYSTEMS ANALYSIS

Planning and analysis of water resource systems — Introduction to water resource planning — Water resource systems analysts — Engineers —Policymakers — Characteristics of systems analysis applications — Identification and evaluation of water management plans: Introduction, Evaluation of time streams of benefits and coasts plan formulation planning models and solution procedures, Objective functions and constraint equations, Lagrange multipliers, Dynamic programming, Linear programming, Simulation and search methods, Computer programs for linear programming — Water resources planning objectives — Managing surface — Water quality — Irrigation planning and operation — Water quality prediction and simulation — Water quality management modeling.

CEI 472 EH GROUND WATER HYDROLOGY

Groundwater and Aquifers [definitions — Types of aquifers — Origin and distribution of groundwater] — Physical properties of aquifers [pressure head — Geological structure — Porosity/void ratio — Saturation — Safe yield — Storage — ... etc] — Darcy's law and hydraulic conductivity and Aquifer flow [theory — field — factors affecting it — conductivity — validity — transimissivity — Anisotropy — .. etc] — Measurement of hydraulic conductivity — Tranmissivity — Specific yield — Storage coefficient — Groundwater exploration — Well construction and pumping — Surface and Subsurface water relations — Subsidence and lateral movement of the land surface due to groundwater pumping — Groundwater quality — Groundwater contamination.

CEI 474 EH HYDRAULIC ENGINEERING

Introduction: An overview of hydraulic engineering, Historical perspectives, Trends for the future — Pipelines: Introduction, Hydraulics of steady flow in close conduits — Hydraulics of unsteady flow in pipes — Flow measurements in pipes — Forces in a pipeline — Review of steady flow in open channels: Resistance and the manning equation, Specific energy and critical depths, Hydraulic jump, Gradually varied flow, Additional transition consideration, Flow measurements — Unsteady free surface flows: Definitions, Governing equations, Applications — Mechanics of sediment transport: Introduction, Sediment properties, Sediment transport, Design of unlined channels, Physical modeling: Introduction, Similitude and the modeling laws, Application of the modeling laws, The river models, Hydraulic structures, Function of hydraulic structures — Dam appurtenances — Pump intake structures — Cavitation in hydraulic structures — Experimental design — Culvert hydraulics — Bridge hydraulics.

CEI 478 EH HYDRAULIC MODELING

Fundamentals: Introduction, Similarity mechanics, Model laws, Classification of hydraulic modeling — River models with fixed bed: Basic concepts, Case studies, River models with movable bed: Basic concepts, Case studies — River models for transport of matter and heat: Basic concepts, Case studies, Basin and Reservoir models — Tidal models with fixed or movable bed, models of hydraulic structures: Discharge conditions, Energy dissipation, Erosion, Vibration and cavitation, Pipeline models, Models for groundwater flow, Special models.

CEI 479 EH TUNNEL ENGINEERING

Introduction and history of tunnels — Tunnels as a water structure — Classification of tunnels — Tunnels for water supply — Tunnels for water drainage — Alignment of tunnels for hydro-projects and selection of their cross sections — Geological studies — Rock loads and soil pressures — Ground elastic reaction — Tunnel linings — Determination of tunnel dimensions — Design of tunnel linings — Methods of construction — Site management and execution.

CEI 480 EH WATER QUALITY MEASUREMENTS

Organic water pollutant analysis: Sample preparation, Sample separation, Ion formation and selection, Computer integration, Spectra interpretation, Natural water analysis by spark source mass spectrometry — The ion source — The mass analyzer — Ion detection — Procedures for elemental inorganic contaminants in water — Sampling and electrode preparation — Relative sensitivity factors and standardized procedures — Calculation of results — Desorption mass spectrometry: Theory and instrumentation, Applications — Pulse polarography: Theory, Instruments and equipment, Applications — Stripping voltammetry: Theory, Apparatus analytical techniques —Theory of ion — Selective electrode — Experimental considerations — Neutron activation analysis — Nature of the NAA method — Illustrative NAA applications in water studies — Atomic spectroscopy — Basic principles — Developments in instrumentation components — Luminescence techniques — Luminescence: Principles, Applications — Introduction to biological monitoring — Assimilative capacity — Chemical versus biological monitoring — Essence of biological monitoring.

CEI 481 EH BASICS OF ENVIRONMENTAL ENGINEERING

Introduction: the environment, The impact of humans upon the environment, The impact of the environment upon the humans, Improvement of environmental quality, The role of the environmental engineer — Water quality: Definitions, Characteristics, perspectives — The hydraulic cycle and water quality — Physical water: Quality parameters: Suspended solids, Turbidity, Color, Taste and odor, Temperature — chemistry of solutions, total dissolved solids, alkalinity, Hardness, Fluoride, Metals, Organic, Nutrients — Biological water: Quality parameters: Pathogens, Pathogens indicators, Water quality requirements, Stream standards, Potable water standards, Wastewater effluent standards, Water purification processes in natural systems: Physical processes: Dilution — Sedimentation and re-suspension — Filtration, GAS transfer, Heat transfer — Chemical processes — Chemical conversions — Biochemical processes — Metabolic processes — Microorganism's natural water systems: Response of streams to biodegradable organic waste — Oxygen balance — Oxygen model — Organic discharge and stream ecology: Application of natural processes in engineering systems (Physical processes — Chemical processes — And biological processes).

CEI 482 EH MODERN IRRIGATION SYSTEMS

Soil, Water, Plant relationship: Soil formations, Soil classification, Field capacity of soil, Soil moisture and its kinds — Soil belt — Root zone — Moisture distribution in soil, Infiltration

rate — Moisture content — Soil salinity — Leaching requirement — Irrigation water classification — Plant tolerance with different irrigation water quality — Farm irrigation methods: modern irrigation systems, Irrigation network: Channel system, Pipe network — Irrigation water management: Irrigation project planning, Environmental effect, Engineering economy of irrigation project, Linear and dynamic planing, Cost recovery of irrigation project, Institutional work, Monitoring system.

CEI 483 EH INLAND NAVIGATION

Introduction to inland navigation — Aspects of inland navigation and their mutual relations — Ships: Types, Ship design factors Classification, Types of inland waterways — Open river waterways: Canalized waterway — Canals — Design of inland navigation waterways: Design methods, Effect of depth, Design of depth, Design of width, Planning and design of curves — Navigation locks: Types, Dimensions, Junctions between harbors and rivers — Hydraulic systems and forces acting on ships — Hydraulic phenomena related to navigation — Bank protection of waterways — Design of revetments: Navigation aids, Navigation regulations

CEI 484 EH ADVANCED IRRIGATION AND DRAINAGE

Irrigation: Review of plant, Soil, Water relationships, Different methods to calculate water requirements — Operation and control concepts — Basics of water management — Automatic control structures and its theory — Water quality and agriculture production — Use of treated swage water in irrigation — Future of the irrigation system in Egypt under decreasing per capita water availability — Governmental plans to improve the irrigation system — Drainage: Review of design of the drainage network — Basics of improving soil quality through drainage projects — Recent construction and maintenance techniques for tile drain, Drainage reuse and limitations — Importance of drainage projects for the environment.

CEI 485 EH DAM ENGINEERING

History of dam projects and relation to human civilization — Hydrological studies related to dam projects — Types of dams and the factors to be considered in theirselection — Design considerations (Geology — Topography — Available materials — Meteorological) — Hydraulic design of dams — Structural design of dams (Foundations — Dam body — Analysis — Construction — Technology — Environmental impacts of dams and reservoirs — Economic calculations and cost benefit analysis of dam projects) — Economic and Financial analysis of dam projects — Dams and hydropower — High aswan dam: Regulation of the nile water, A huge civil structure, Dam projects on the nile basin and the future development and effects on the nile water

CEI 486 EH WATER RESOURCES ENGINEERING

Calculation for water consumption for different purposes — Water quality requirements (Biological and chemical) — Stream flow in open channels and exposure to contamination — Water storage and distribution — Development of water resources — Water treatment — Drainage water reuse and limitations — Industrial development and water requirements and pollution loads — Waste disposal and relation to water resources — Water resources economics — Water resources in Egypt in the future — Environmental laws related to water resources

CEI 487 EH PUMPING STATIONS ENGINEERING

Types of pumps and classification — Selecting pumps and design considerations — Pump station and structures — Solar energy — Wind energy and pumps — Economics of pumps for irrigation projects.

CEI 488 EH GROUND WATER ENGINEERING

The hydrologic cycle — Types of aquifers and properties — Groundwater flow — Methods of groundwater exploration — Well construction — Development and maintenance — Economics of wells and groundwater — Groundwater quality and its usage for different purposes — Groundwater utilization in coastal areas — De-watering techniques

CEI 489 EH HISTORY OF HYDRAULIC ENGINEERING

Introduction — Historical development of concepts in open channel hydraulics — Fluid mechanics and fluvial hydraulics through the history — Old dams in the world — Case study: Sadd el-Kafara, Dimensions and reconstruction of the dam, Stability studies, Dating of the dam — Early hydraulic civilization in Egypt — Methods of irrigation — Old methods of lofting water — Old storage works: Case study the FAYUM depression in Egypt, Construction and operation of the ressrvoir, Water supply aqueducts in the world — Examples on old pressure barrels — Case study: Old water Supply systems.

CEI 490 EH ENVIRONMENTAL IMPACT ASSESSMENT

Introduction to environmental science — How to environmentally evaluate a project — Evaluation procedures — Environmental impact assessment — Environmental control law and applications — Case study.

4- COURSES OFFERED BY THE DEPARTMENT OF PUBLIC WORKS

CEP 100 CF PLANE SURVEYING

Introduction to surveying and mapping: History, Definitions, Classifications, Units, Scales, Maps, Coordinates, Reconnaissance — Sketch drawing, Direct and indirect distance measurement, Methods of measurements — Corrections, EDM — Angle and direction measurement — Location of points, Angles and directions, Bearings, azimuths — Compasses, Telescopes — Theodolites, Errors — Adjustment, Measurement and setting out of angles — Surveying operations and computations: Traverse, Traverse adjustment, Coordinate transformation, Plane-table traverse, Triangulation and trilateration, Choice of figure, Measurements for triangulation, Location of points by intersection, Resection — Area calculation and land division — Introduction to theory of errors and their applications in surveying.

CEP 101 CH SURVEYING

Introduction to surveying and mapping: History, Definitions, Classifications, Units, Scales, Maps, Coordinates, Reconnaissance, Sketch drawing, Direct and indirect distance measurement, Methods of measurements, Corrections, EDM, Angle and direction measurement, Location of points, Angles and directions, Bearings, Azimuths, Compasses, Telescopes, Theodolites, Errors, Adjustment, Measurement and setting out of angles — Surveying operations and computations: Traverse, Traverse adjustment, Coordinate transformation, Plane-table traverse, triangulation and trial iteration, Choice of figure, Measurements for triangulation, Location of points by intersection, resection — Area calculation and land division — Vertical control (leveling): Definitions, methods of determining relative heights, Bench marks, Errors, Profile level notes.

CEP 200 CF TOPOGRAPHIC SURVEYING

Vertical Control (Leveling): Definitions, Methods of determining relative heights, Bench marks, Errors, Profile level notes — Mapping: General, Datum for mapping, Topographic maps, Contours, Methods of plotting, Automatic plotting, Automated mapping, Digital

mapping, Principles of aerial surveying — Remote sensing, photo interpretation, engineering applications — Introduction to Geographic Information System (GIS) — Surveying role in engineering projects — Surveying and mapping.

CEP 260 CH SANITARY INSTALLATIONS IN BUILDINGS

Preliminary studies for plumbing — Plumbing equipment and their erection — Design of internal water supply system — Design of sanitation works for buildings — Fire fighting works — Hot water works — Special structures [Swimming pools — Laundries — Kitchens.....etc.].

CEP 300 CF ENGINEERING SURVEYING

Modern techniques used in surveying: Total stations, Satellites, Image processing system — Rout surveying: Curves, Horizontal, Vertical, Transition — Earth works operations, Volumes, Mass-haul diagrams — Map projections systems — Mine and tunnel surveying — Hydrographic surveying. Construction surveying.

CEP 301 CH ENGINEERING SURVEYING

Modern techniques used in surveying: Total stations, Satellites, Image processing system — Mine and tunnel surveying — Hydrographic surveying — Construction surveying.

CEP 330 CH HIGHWAY AND AIRPORT ENGINEERING (1)

Highway functions and classifications — Highway planning and route selection — Highway economics — Geometric design controls and criteria — Sight distances — Horizontal alignment — Vertical alignment — Consistency of alignment — Cross section elements — Planning and design of the at-grade intersections — And interchanges — Design of urban road network facilities and road furniture — Environmental and safety considerations in geometric design aspects — Planning and geometric design of airports — Computer applications in geometric design.

CEP 331 CH TRAFFIC ENGINEERING

Introduction: What is traffic engineering, Traffic problems, Characteristics of driver, Pedestrian, Vehicle, road — Traffic Flow Characteristics: Traffic flow elements, Volume, Speed, travel time and delay studies, Capacity and Level of Service, Weaving at Intersections, Freeways, And expressways — Traffic control devices: Definition, Types and purposes of devices, Installation requirements — Uniformity of the devices, Intersection Control: Conflict points at intersections, Types of intersection control, Pedestrian control, Bicycles control — Traffic signals: Warrant for use of traffic signals, [Phasing] Vehicular and pedestrian safety requirements, Saturation flow, Cycle time calculation, Green allocation — Parking: Types of parking facilities, Parking characteristics, Parking surveys, Design principles of parking spaces. Accidents and road safety: Factors involved in accidents, Accidents report, Accident statistics, Types of accidents and trends, 91Studies of high-accident and safety.

CEP 332 CH HIGHWAY AND TRAFFIC ENGINEERING

Highway functions and classifications — Traffic characteristics — Geometric design controls and criteria — Sight distances — Horizontal alignment — Vertical alignment — Cross — section elements — Materials characterization — Stresses in flexible pavements — Stresses in concrete rigid pavements — Structural design of flexible pavements — Structural design of concrete rigid pavements — Structural design of industrial pavements and bridge decks.

CEP 333 CH Highway Engineering and Transportation Planning

Highway engineering: Characteristics of road materials — Pavement induced loading and stresses — Pavement structural design — Construction of road embankment and pavement — Road drainage, Road maintenance — Asphalt in coastal and hydraulic structures and slope

protection — Transportation planning: Goals and objectives — Types of planning — Data collection and analysis — Planning methodology.

CEP 334 EH TRAFFIC ENGINEERING

Traffic flows elements — Characteristics of driver — Pedestrians — Vehicles and roads — Fundamental principles of traffic flow. Road classification — Capacity of interrupted and uninterrupted flow conditions — Level of service — Type of different resistance to vehicle motion and their effect on vehicle performance — Traffic control devices: purposes — Types — Installation requirements and uniformity of the device. Intersection control: Conflict points — Types of control — Pedestrian and bicycles control — Traffic signals: Warrant for use, Phasing, Vehicle and pedestrian safety requirement — Parking: types of parking facilities, design principles of parking spaces — Overtaking — Vertical alignment: grades, Vertical curves, Vertical clearance, Horizontal alignment: Radius, Super elevation, Road width and widening.

CEP 341 CH TRANSPORTATION PLANNING AND RAILWAY ENGINEERING

Transportation Planning — Goals and objectives — Types of planning — Data collection and analysis — Railway engineering — Study of the external forces affecting the wheel and rails while moving or braking or on vertical and horizontal curves with applications to design horizontal and vertical curves — Capacity estimation for underground metro and rural lines — Study of vibrations — Thermal change — Automatic equilibrium and dynamic effect of track on embankments — Bridges and tunnels — With applications for design of rail — Sleeper, and ballast for both underground metro and rural lines.

CEP 350 CH TRANSPIRATION PLANNING

Introduction: Problem definition, Planning process, Transportation and land use, Site, Corridor and regional planning levels — Travel characteristics — Supply and demand analysis — Data Collection: Sampling, Home interview — Roadside interview — Pre-paid mail questionnaire — Monitoring Simplified demand analysis: Trend analysis, Elasticity, Manual methods. Trip generation: Trip distribution, Growth factor methods, Gravity models, Intervening opportunity models — Modal split: Diversion curves, Probabilistic models (Logic and probity) — Traffic assignment: All or nothing, Capacity restraint, Incremental. Computer in transportation planning. Evaluation of transportation alternatives: Measures of effectiveness in evaluation, Types of impact, Cross benefit analysis, Scoring method.

CEP 360 CH SANITARY ENGINEERING (1)

Preliminary studies for water supply projects — Water sources and collection works — Water treatment processes — Water storage works — Water analysis and sampling — Water distribution and networks — Water supply planning.

CEP 361 CH SANITARY ENGINEERING (1)

Preliminary studies for water supply projects — Water sources and collection works — Water treatment processes — Water storage works — Water analysis and sampling — Water distribution and network — Water supply planning.

CEP 370 CH ENVIRONMENTAL ENGINEERING

Introduction to environmental science — Water quality control — Solid waste management: Collection, Handling and transportation, Separation and selection, Treatment, Disposal, Recycling and reuse — Air pollution : Sources and types, Measuring and control — Pollution prevention — Noise — Visual pollution — Environmental control law and applications.

CEP 400 EH COMPUTER APPLICATIONS IN SURVEYING

Introduction to computer graphics: History, Applications, Interactive graphics system and graphics system software — Drawing elementary figures : Plotting points, Line drawing, Circle drawing, Ellipses, ... etc — Graphics fundamentals: display screen viewing, Window to view port mapping, Clipping, And color — Two-Dimensional geometric transformation : translation, Rotation, Scaling — Application software: ACAD planimetry (Mapping), Surfer for contouring and volume calculations, Road software, Sewer software, Pipeline design software, Transportation software.

CEP 410 EH GEODETIC SURVEYING

Geodetic surveying and the different methods for position determination on earth surface — Least squares adjustment of geodetic measurements and statistical analysis of adjustment results — Astronomic measurements and its application in geodetic surveying.

CEP 411 EH THE EARTH GRAVITY FIELD

General introduction on the shape of the earth and its relation "Galaxy and sun system" — Earth interior and mathematical approximation of the earth — Earth gravity field: Gravity acceleration, Gravity potential — Equipotential surfaces: The geoid and its relation with the mathematical surface of the earth — Different methods for gravity measurements — Effect of gravity field on precise leveling — Effect of gravity field on reduction of the computation surfaces — Effect of gravity on astronomic measurements — Computing the earth crystal vertical movements using gravity variation — Effect of earth gravity on the orbits of the satellite used in surveying — Training on the relative gravity measurement devices — Studying the effect of the earth gravity field on the positions of the terrestrial triangulation — Different methods for geoid determination and its application on relative height determination using global positioning system (GPS).

CEP 412 EH SURVEYING WITH GPS

Modern techniques used in surveying: Total Stations, Satellites, Image analysis system. Mine and tunnel surveying — Hydrographic surveying — Construction surveying.

CEP 420 EH PHOTOGRAMMETRY AND REMOTE SENSING

Basics and principles of remote sensing: Definitions, Technique steps, Energy sources, Electromagnetic waves and radiation of bodies — Advantages of remote sensing technique: Characteristics of data acquired by remote sensing method, Photo and image interpretation — Basics to be followed in choosing image for studies — Control points and ground truth observations: Basic information, Factors affect choosing and training samples, testing procedure — Fieldwork steps : Sensors and satellites — Different applications in engineering and environmental fields — The use of remote sensing imaginary in GIS applications — Hardware and software required for image processing and interpretations.

CEP 421 EH GEOGRAPHIC INFORMATION SYSTEM GIS

Introduction to GIS: GIS basis and idea, Importance and uses of GIS, Examples, Different data types used in GIS — Digital mapping: Production and updating of digital maps, Datum and map projection — Digital images Satellite multi-spectral images and advantages and types, Resolution of images and geo-coding systems, Digital data acquisition and merging to maps — Aerial photography: Photograph accuracy and ground control system, Production from aerial photos — Attribute data and data management: Data files, Creation, Descriptive attribute, Link attribute to geographic features — Adding attributes from an existing digital files — Coordinating systems for a multi — Coverage data base — Applications in GIS (Modeling and Special functions) — Examples of application — Network analysis results presentation and analysis — Hardware and software requirements.

CEP 430 CH HIGHWAY AND AIRPORT ENGINEERING (2)

Road construction materials: Design and properties of bituminous mixtures — Materials characteristics — Tests and specifications — Structural design of roads: stresses in flexible and rigid pavements — Vehicle and traffic consideration — Soil stabilization — Structural design of flexible pavements — Structural design of rigid pavements — Design of heavily loaded industrial pavements and bridge decks — Structural design of airport pavements — Road construction and drainage design: Construction of flexible and rigid pavements — Quality control — Drainage design of roads and airfields — Pavement maintenance and rehabilitation: Maintenance management, Computer applications in highway design.

CEP 431 CH HIGHWAY AND TRAFFIC ENGINEERING

Highway functions and classifications — Traffic characteristics — Highway capacity — Geometric design controls and criteria — Sight distances — Horizontal alignments — Vertical alignments — Cross-section elements — Materials characterization — Stresses in flexible pavements — Stresses in concrete rigid pavements — Structural design of flexible pavements — Asphalt in hydraulic structures: Linings, Asphalt intersections, Traffic control devices, Traffic safety, environmental impact.

CEP 432 CH HIGHWAY AND TRAFFIC ENGINEERING

Introduction — Road network planning principles — Traffic studies — Road hierarchy and classification for urban and rural roads criteria and control of geometric design — Sight distances — Horizontal and vertical alignment — Cross section elements — Principles of intersection design — Parking design — Road design and landscaping — Road design and urban planning.

CEP 433 EH CONSTRUCTION TECHNOLOGY OF HIGHWAYS AND AIRPORTS

Embankment construction technology — Pavement construction technology — Management of bituminous construction — Operation and inspection of asphalt plants — Layout of plants: Materials handling and storage, Cold aggregate feeding, Drying and heating, Screening Equipment, Operations, Inspection. Surface dressing techniques — Stabilization techniques — Concrete roads: Construction techniques — Quality control — Construction requirements for asphalt additives: Polymers, Extenders such as sulfur and fillers, Mineral fillers, Antistripping agents, Antioxidants, Hydrocarbons, Fibers and viscosity modifiers — Asphalt in hydraulic structures: Asphalt in asphalt concrete linings — Asphalt in reservoirs and dams — Asphalt in canals and drainage channels — Asphalt in bank protection — Asphalt in coast — Protection structures.

CEP 434 EH MAINTENANCE OF HIGHWAYS AND AIRPORTS

Pavement distresses and evaluation: Pavement distresses and evaluation for flexible pavement, Pavement distresses and evaluator rigid pavement, Tests of pavement evaluation, Method of evaluation — Pavement maintenance: pavement maintenance of flexible pavement, Pavement maintenance of rigid pavement, Footpath curbs and pitching maintenance, Maintenance of unpaved road — Maintenance of drainage systems: Maintenance of open and closed channel, Maintenance of storm water system, Recycling and rehabilitation of pavements, Pavement management systems.

CEP 435 EH AIRPORT ENGINEERING

Airport planning — Airport elements — Runway location and orientation — Taxiway system — Airport apron — Aircraft types and characteristics — Runway design (configuration, length, Width, Gradients. Taxiway design: Configuration, Width, Gradients. Apron design —

Heliports — Structural design of airports and heliports pavements — Drainage systems and design — Airfield lighting systems — Airport marking and signing.

CEP 436 EH HIGHWAY ECONOMICS

Method of economic analysis: Equivalent uniform annual cost method — Present worth cost method — Equivalent uniform annual net rate — Net present value method, Benefit / cost ratio method, Rate of return method — Highway transportation cost — Road user consequences — Traffic accidents, Economic analysis in developing countries, Illustrative problems.

CEP 437 EH TRAFFIC SYSTEM MANAGEMENT

Introduction: definition, Objectives of traffic management, Planning process for TSM traffic management measures — Measures for traffic operations improvements: one Way street, Coordinating signal timing, Restricting turning movements, Tidal and reversible flow, Monitoring of traffic, metering ramps. Measures for public transit. Measures for pedestrians and bicycles — Management of heavy goods vehicles — Parking control.

CEP 440 CF RAILWAY ENGINEERING

Railway dynamics: Tractive effects, Tractive resistance, Acceleration, Braking, Line capacity, Time table design, Railway alignment: Speed, Vertical and horizontal curves design, Transition curves, Longitudinal and cross section — Structural railway track design: Sub-grade, Track vibration and noise, Rail wheel interaction, Derailment, Conning of wheel. Track buckling — Forces acting on rail, Rail (Defects — Wear — Stress — Design — Gaps and joints — Welding). Sleeper (function, type, design, fastening). Ballast (function, type and design). Unballasted track technology — Track turnouts and switches: Switches, Diamond crossing, Cross over, Scissors cross over, Slipped — Double junction — Railway stations and yards: Passenger and freight stations (Location and Requirements). Locomotive — sorting — And marshaling yards design — Containers transport and their yards station and car capacity — Railway cost and fare — Railway signals: Classifications and types, Signal cabin. Mechanical devices of interlocking — Train movement control — Automatic block system (ABS) — Centralized traffic control (CTC) — Automatic train controls (ATC) system — Railway maintenance and renewal: Specifications and conditions for maintenance and renewal and equipment used — Railway rapid transport: performance and functions.

CEP 442 EH ECONOMIC OF RAILWAY CONSTRUCTION AND MAINTENANCE

Railway stations and yards alignments — Means for safety movements of trains along railway lines — Erection — Maintenance and renewal of railway lines — Railway economy (Transportation costs and fares).

CEP 450 EH PRINCIPLES OF TRANSPORTATION ECONOMICS

Introduction: What is economics all about, The distinction between micro and macro economics, Transport economics — Principles of micro-economics: Demand, Supply and prices, Taxes and subsidies, Elasticity, Demand and supply relationship — Appraisal of transport investment projects: Net present value approach, Internal rate of return, Risk and uncertainty, Cost, Benefit analysis, Accident and travel time costs: Gross output approach, Net output approach, Insurance premium approach, Legal compensation approach, Reduction in risk approach, Travel time cost — Pricing of transport service: profit maximization approach, Maximization of second net benefit — Marginal cost pricing in transport Subsidies: types of transportation subsidies, Decreases in subsidies.

CEP 451 EH PLANNING AND MANAGEMENT OF PUBLIC TRANSPORT

Introduction — Characteristics of transit modes — Characteristics of transit facilities — Transit demand modes — Transit system performance — Transit economics and fare system — Surveys of transit system.

CEP 452 EH TRAFFIC IMPACT ANALYSIS

Introduction: Need and purpose of site impact studies, Transportation, Land use cycle, Accessibility, Movement hierarchy, Major issues, Study timing, Who should prepare traffic impact studies — Initiating traffic impact studies: warrants for studies, Extent of study, Study area, Selection of horizon years, Peak traffic, Background study data, Data collection — Site traffic: components, Methodologies to forecast non site traffic, General guidelines — Site traffic generation: introduction to traffic generation, Single and mixed — Use development — Estimation of trips generated — Site traffic distribution and assignment traffic distribution methods — Site traffic assignment — Pass — By trips — Traffic analysis: Total traffic estimate, Identification of impacts and needs, Level of service for intersections, Transportation demand management, Safety, Formulation of remedial measures — Site access. Site improvements: network improvements, Localized improvements, Program improvements, Grade intersections and access drives — On Site planning and parking principles: access points, Vehicular storage, Internal vehicular circulation, Service drives, Signs and markings, Parking, Pedestrian and transit facilities — Environmental impact principles: Types of environmental impact, Techniques to assess level of impact, Pollution levels, Remedial measures — Case studies: Applied examples of developments, Positive and negative traffic impacts, Remedies.

CEP 460 EH SANITARY ENGINEERING (2)

Preliminary studies for wastewater projects — Wastewater sources and their characteristics — Sewerage systems planning — Design and execution — Wastewater treatment processes — Wastewater analysis and sampling — Wastewater disposal and reuse — Sludge treatment — Disposal and reuse.

CEP 461 CH SANITARY ENGINEERING (2)

Preliminary studies for wastewater projects — Wastewater sources and their characteristics — sewerage systems planning — Design and execution — Wastewater treatment processes — Wastewater analysis and sampling — Wastewater disposal and reuse — Sludge treatment — Disposal and reuse.

CEP 462 EH INDUSTRIAL WASTE WATER

Definitions of industrial and hazardous wastewater — Types of industrial wastewater — Types of hazardous wastes — Collection — Handling and transportation — Treatment works — Disposal — Recycling and reuse.

CEP 463 EH WATER TREATMENT FOR INDUSTRIAL PURPOSES

Introduction to industrial types and their water needs — Water desalination — Iron and manganese removal — Water softening — Scaling and demineralization — Water flotation — Water filtration — Water aeration — Water recycling.

CEP 470 CH ENVIRONMENTAL ENGINEERING

Introduction to environmental science — Water sources and supply works: Preliminary studies for water supply projects, Water sources and collection works, Water treatment and storage works, Water distribution and networks — Wastewater works: waste water sources,

Sewerage systems, Waste water treatment, Disposal and reuse, Sludge treatment, Disposal and reuse — Solid waste management: Collection, Handling and transportation, Separation and selection, Treatment, Disposal, Recycling and reuse.

CEP 471 EH ENVIRONMENTAL IMPACT STUDIES

Introduction to environmental science — Definition of environmental impact study — Required preliminary studies — Impact of projects before, during and after construction — Impact on wild life — Impact on human life — Case study — Environmental control law and applications.

CEP 472 EH ENVIRONMENTAL EVALUATION STUDIES

Introduction to environmental science — How to evaluate a project environmentally — Evaluation procedures — Environmental impact assessment — Environmental control law and applications — Case study.

CEP473 EH SOLID WASTES MANAGEMENT

Solid waste sources and types — Solid waste collection and handling. Solid waste transportation — Separation and selection of solid waste — Solid waste treatment works — Solid waste disposal — Recycling and reuse. Solid waste quality measuring and control — Solid waste management.

CEP 499 CH PROJECT

The general aim of the project is to allow each student to integrate all the disciplines he has studied in a unified chunk of knowledge. On the behavioral side; Students are allowed to work in a team so as to practice working in a collaborative environment. Since any engineering endeavour should result in a well planned, executed, and maintained system; an important aspect of the project is to let the students be trained in following a scientifically-based engineering methodology for the project implementation. This emphasizes also a proper documentation and presentation procedure. On the technical side; students are allowed to choose among a number of projects suggested by the different staff members. The topics of these projects usually reflect the unified educational policy of the department and are usually related to different subjects in the curriculum.

5- COURSES OFFERED BY THE DEPARTMENT OF ARCHITECTURE

ARC 101 CF ARCHITECTURAL DESIGN (1)

First design studio to introduce students to the perception of architectural spaces and develop abilities to design simple spaces and compositions by considering the functional activities and circulation on simple requirements. Exercises with simple spatial requirements and study the design considerations of spaces. Each exercise focuses on certain design objectives as part of the set of objectives while addressing the basic design concerns of circulation — Orientation — Privacy — Spatial compositions — etc... .

ARC 110 CH BUILDING CONSTRUCTION

The course introduces students to basic components of buildings — Building materials and types of finishes. Exercises to train students to comprehend architectural drawings and the notions used. The course includes load-bearing constructions of brick and stone — Lintels — Arches — Vaults — Domes — Thermal insulation — Water proofing — Staircases in buildings (Types — Materials and design considerations) — Architectural finishing for floors — Walls and ceilings — Joints in buildings and architectural treatments.

ARC 111 CF BUILDING CONSTRUCTION (1)

Introductory course to basic components of buildings — Building materials and methods of construction (load-bearing and skeleton types) — Exercises to train students in detailed drawings of: Load-bearing constructions of brick and stone — Lintels — Arches — Vaults — Domes — Foundations — Skeletal construction of concrete and timber — Retaining walls (Masonry — Concrete) — Thermal insulation and water proofing — Stairs (Concrete — Timber — Steel).

ARC 130 CH HISTORY OF ART AND ARCHITECTURE (1)

The ancient civilizations of Egypt and Mesopotamia — The classical Greek and Roman civilizations — The Early Christian and Byzantine periods are the focus of this course through an analytical comparison of selected monuments to illustrate the unity of architectural expression in each period with the cultural and environmental influences and construction methods.

ARC 131 CH THEORIES OF ARCHITECTURE (1)

The course consists of an introduction to basic concepts of architectural spaces through the study of basic functional elements — Services — And circulation elements — Openings (ventilation and lighting) — Systems of construction. Aesthetics and principles of architectural compositions: Unity, Balance, Contrast, Proportions, Scale, Rhythm, Characters — Degrees of enclosure of architectural spaces; an introduction to design principles — Concepts and considerations in residential buildings — Kindergartens and schools.

ARC 141 CH HUMAN STUDIES IN ARCHITECTURE

Introduction to the role of human issues in design — The behavioral and psychological dimensions — The principles of semiotics and symbolism in architecture are explored to reach a better understanding of the human role and to take informed design decisions.

ARC 150 CH FREE HAND DRAWING

The course aims at the development of perception — Understanding and design of two and multidimensional compositions — And the introduction to basic elements of visual design and concepts of artistic creation through exercises with linear elements — Planes and solid objects — Texture and color.

ARC 151 CH VISUAL DESIGN

Perception and rendering of form — Space and light — Reproducing proportions — Shapes and compositions through a variety of rendering techniques and materials — Exercises to train students using different materials for reproducing selected compositions.

ARC 161 CH SCIAGRAPHY AND PERSPECTIVE

Study of the principles of casting shades and shadows in architectural drawing as a means of presentation. Exercises in shade and shadow in architecture; lines — Planes — Volumes as well as elements: Stairs, Openings, Cornices, Arcades, Pergolas, Architectural compositions. Introduction to the principles of projection in representing architectural spaces and volumes — Developing graphic skills in perspective representation (One and two vanishing points perspective) — Shadow and reflection in perspective and perspective in photography.

ARC 202 CF ARCHITECTURAL DESIGN (2)

Design studio deals with the development of skills to reach creative solutions in the manipulation of spaces — Volumetric compositions of exteriors and interiors while using up-to-date construction methods. Each exercise focuses on certain design objective while addressing the basic design concerns.

ARC 212 CF BUILDING CONSTRUCTION (2)

Study of details of construction — Finishes — And maintenance. The course aims at developing the skills in detailed drawings: Execution of buildings, Setting out foundations, Excavation, laying foundations, Super structure works. Joints — (Settlement — Expansions...) — Carpentry of doors and windows. Curtain walls. Internal partitions — Timber construction of trusses — Lamella. Finishing materials (internal and external) — Plaster and painting works — Maintenance of buildings — Repairs and improvement of performance.

ARC 230 CH HISTORY OF ART AND ARCHITECTURE (2)

An analytical study of the art and architecture of the early islamic — Ayyubid and Abassid periods with an emphasis on selected monuments of Egypt from the tulunid — Fatimid — Mamluk and Ottoman periods to illustrate the unity of architectural expression in each period with its culture and environment — Examples from religious and secular architecture are studied in lectures and field trips — The course also surveys the architecture of west Europe: The romanesque, Gothic and renaissance architecture.

ARC 232 CH THEORIES OF ARCHITECTURE (2)

An introduction to the scientific approach in solving design problems and to the methods of design — Program formulation — Diagnostic analysis — Conceptualization — and development of design solutions — Comparison and appraisal — and communication of best design solution. An introduction to creativity stimulation techniques in design using the vice-versa techniques — Brain storming — Analogous design — Cybernatics in architecture — Introduction to design principles — Concepts and considerations in commercial buildings and health care facilities.

ARC 271 CH COMPUTERS IN ARCHITECTURE

Introduction to computers as a tool for architects and its applications in drawing and presentation — A general overview of computer components — Computer aided drawing — And modeling.

ARC 281 CH ENVIRONMENTAL CONTROL

The building as mediator between humans and the environment is the theme of the course. A study of the thermal environment: climate and its elements — Factors influencing site climate — Climatic data — Bioclimatic chart and comfort zone — Solar radiation and sun-path diagram. Design of shading devices — Thermal exchange between building and environment — Ventilation — Air movement and opening — Luminous environment: Visual field — Contrast — Illumination intensity — Natural lighting — Light distribution — Influencing factors — Measurements — And the design solutions.

ARC 303 CF ARCHITECTURAL DESIGN (3)

Design studio concerned with the development of skills in solving composite problems to include different functions and circulation while paying attention to limitations of site and environment — Identifying a principal objective in the design solution — Special emphasis on the study of internal spaces.

ARC 311 CF WORKING DRAWINGS (1)

Introduction studio to preparing working drawing documents through the study of specialized sets of drawings — Symbols of each — Information and data — Dimensions and levels — Finishing tables and openings tables — Coordination between specialists — And drawing of architectural detailing — Students prepare and produce a whole set of working drawings including architectural — Plumbing and electrical drawings.

ARC 312 CF PLANNING AND HOUSING STUDIES (1)

The course introduces the student to the theoretical background that enables him conduct the required studies for upgrading the urban environment. A field study project to deal with a deteriorating district where all the necessary steps are taken. The course also involves the definition of new towns and the theory of its formation and the study of its components (Roads — intersection — Parking) — The housing curriculum aims at defining the housing problems in Egypt teaching the design parameters for the neighborhood and applying it on the design of a residential neighborhood in one of the new towns.

ARC 313 CH BUILDING TECHNOLOGY

Aims at gaining familiarity with new technologies of building industry — Building manufacturing and construction by studying modular coordination — Modular grids — Standardization — Components — Joints — Pre-fabricated buildings — Types and methods (Off site — In site) — Heavy and light prefabrication — Pre-stressed concrete — Potentials and applications. Machinery in construction processes.

ARC 321 CH LANDSCAPE DESIGN

Introduction to landscape design and its importance in architectural design by studying development through history — And various concepts of landscape design. Exercises to develop creative solutions to landscaping problems by recognizing and taking advantage of natural features of site —Natural and architectural elements.

ARC 333 CH THEORIES OF ARCHITECTURE (3)

An introduction to theories and philosophy of the international styles of the 20th and the modern movement: The organic theories of Sullivan and Wright, The functional formalism of Le Corbusier, The functional technological theories of the Bauhaus and Gropius — The structuralism of Mies van der Rohe — And the expressionism of mendelson. Also an introduction to design principles — Concepts and considerations in office buildings — Communication buildings and industrial plants.

ARC 341 CH PROFESSIONAL PRACTICE AND LEGISLATION

Introduction to the professional and legal responsibilities of the architect and the contractor as well as the building codes and land use Legislation. Principles of professional practice — Scope of work — Fees — Tenders — Contracts between owner and architect and between owner and contractor. Building defects and guarantee — Legal responsibilities.

ARC 351 EH AESTHETICS IN ARCHITECTURE

The course focuses on studying the theories of aesthetics and the principles of artistic compositions and the philosophical approaches. Creativity in design is highlighted — Visual perception of spatial formations is also analyzed.

ARC 352 EH ADVANCED COMPUTER APPLICATIONS

The course is concerned with computer applications that help in decision-making processes at different stages of architectural design. The applications cover the different fields related to the architectural profession practice including word processing — Spreadsheets and database programs. The approach is to discuss theories and concepts rather than concentrating on a certain specific application.

ARC 353 EH INTERIOR DESIGN

The course aims at the development of skills in designing internal architectural spaces — The course discusses the characteristics of the basic elements of design (Form — Color — Texture — proportions — Scale) — Principles of spatial composition (Balance, Harmony,

Contrast, Rhythm, Unity, Variety, Emphasis) — Perception of architectural spaces — Materials and Details — Integration between forms and function.

ARC 354 EH URBAN DESIGN

The course is concerned with elements and techniques of urban design. It includes basic principles of urban space design: (Social and economical influences, Formal aspects) — Factors influencing the design decisions: (Land uses, Movement) — Visual treatments — Design criteria — Regulations — And legislation at urban scale.

ARC 355 EH URBAN SOCIOLOGY

The course focuses on the theoretical approaches in urban development and social structure — Immigration and adaptation — Directions of urban growth and its distributions — Basic influential variables — Alternatives of expected urban growth in Egypt.

ARC 356 EH DEVELOPMENT OF RURAL COMMUNITIES

The course introduces the basic terminology and concepts of development — Sustainable development and environment. It presents the problems related to the development of rural communities and discusses the proposed directions towards solving the problems.

ARC 357 EH ARCHITECTURAL RENDERING

The course aims at developing the skills of presenting the architectural designs verbally as well as graphically. It includes the applications of different tools — Techniques and materials used for producing appropriate architectural rendering.

ARC 381 CH ACOUSTICS IN BUILDINGS

The course aims at identifying the design principles of acoustics in buildings — Architectural treatment and noise control through the study of: acoustics in enclosures — Dispersion — Resonance — Absorption — Reverberation time — echo — And shadow. Absorbing materials — Porous materials — Acoustic panels — Acoustic plaster — And masks. distribution of absorbing and reflecting materials. Principles of design (Auditoriums — Theatres — Concert halls). Noise — Measurements — Sources — Transportation — And control.

ARC 400 CH ARCHITECTURAL DESIGN PROJECT STUDIES

Preparing the preliminary studies to the final design studio that include the basic criteria of design — The formulation and development of the program — Choosing the site — Collecting necessary data and analytical studies of program and site. Preparing a detailed comprehensive report including program analysis — Sites analysis and design criteria.

ARC 401 CH PROJECT

Final design studio of a complex problem to reflect student's skills in handling and integrating all knowledge acquired through years of study. The aim is to achieve design objectives on both urban and architectural levels as well as details.

ARC 404 CH ARCHITECTURAL DESIGN (4)

Design studio aims at developing design skills in solving problems within an urban context with special constraints and possibilities. Emphasis is on the urban background and its interaction with architectural design.

ARC 412 CH WORKING DRAWINGS (2)

Studio to prepare working drawing documents of a preliminary design project and to apply knowledge gained from various classes with an emphasis on working details — And materials to produce a whole set of drawings including electrical and plumbing drawings.

ARC 413 CH PLANNING AND HOUSING STUDIES (2)

The course aims at developing the students abilities at planning new towns with emphasis on the economical — Social factors — The analytical study of projects — Regional planning studies — Master plan for a new town — Design of an urban center — Housing studies of a housing project — Research and analysis for an existing town.

ARC 434 CH THEORIES OF ARCHITECTURE (4)

The course traces the development of architectural thought in the second half of the 20th century and its effects on local architecture — A study of architectural spaces in the local tradition and the influences on local contemporary architecture — An introduction to design principles — Concepts and considerations in cultural and civic centers.

ARC 461 EH Architectural Criticism and Project Evaluation

The course emphasizes the multiplicity of architectural thinking. It introduces the theoretical approaches of contemporary architectural thoughts. The course discusses concepts of integration and comprehensiveness in architectural solutions — Principles of architectural criticism — and techniques of evaluating projects are discussed.

ARC 462 EH URBAN RENEWAL

The course emphasizes the importance of urban stock that needs preservation and upgrading. It discusses the issues of improving the infrastructure — Restoration of buildings and development of urban environment — Social and economic development. The course is concerned with techniques of manipulating buildings and urban spaces — Guidelines and regulations — Stages of implementation and sources of finance.

ARC 463 EH HOUSING IN DEVELOPING COUNTRIES

The course aims at identifying the problem of housing in Egypt — Housing strategies since the fifties — Housing problems for low-income groups — Informal housing and the role of people participation and self help projects — Social and Economic factors influencing the planning of residential sites — Housing as a process rather than a product — Study of planning criteria and identifying the role of the planner — The architect — And the user.

ARC 464 EH LOCAL AND CONTEMPORARY ARCHITECTURE

Study of the historical roots of local architecture — The present status and the influential factors on local architectural thoughts — The role of social and cultural and economic factors in shaping the contemporary architecture.

ARC 465 EH ADVANCED TECHNICAL INSTALLATIONS

The course aims at gaining familiarity with new techniques used in advanced technological systems in buildings (Alarm systems — Fire fighting systems — Communication systems — Air conditioning systems — Electronic control systems) — Basic concepts are illustrated. Materials and technical installations are addressed.

ARC 466 EH URBAN AND ARCHITECTURAL HERITAGE

The course emphasizes the importance of architectural and urban heritage. The study includes criteria for classifying and documenting the heritage — Study of environmental problems: subsoil water, Air pollution, Visual pollution, Misuse of buildings and spaces, Negligence and lack of maintenance — The principles of preservation and techniques of restoration of architectural heritage.

ARC 467 EH ENVIRONMENTAL DESIGN AND ENERGY CONSERVATION

The course aims at identifying the inefficiency of utilizing energy in contemporary buildings — The efficiency of utilizing energy in traditional architecture in different climatic regions — Techniques of passive solar energy applications — The concept of energy conservation and recycling — New trends and efficient use of energy.

ARC 490 CH QUANTITIES AND SPECIFICATIONS

Introduction to the writing of specifications documents presented with working drawings as part of the contract documents — General and special conditions of the job — Defining the scope of work and detailed descriptions of items and materials — Quantity surveying (rules and methods) — Check listing the finished work and detecting faulty items.

ARC 491 CH FEASIBILITY STUDIES AND CONSTRUCTION MANAGEMENT

The course emphasizes the importance of feasibility studies in making design decisions — Economics of land — Initial costs and running costs. Projects turnovers and marketing studies. The second part of the course emphasizes the importance of construction management — Planning and time scheduling of jobs — Evaluation of programs and critical path method — Cost-time analysis.

6- COURSES OFFERED BY THE DEPARTMENT OF URBAN PLANING

UPL 211 CH HISTORY OF PLANNING

The course aims at defining the relation between design and city planning — The function of spaces in different civilizations and the relationship between social — Economical — Political factors and systems of town planning by analytical studies for history of planning and design of spaces in the following civilizations: Egyptian civilization — West Asian civilization — Greek civilization — Roman civilization — Middle Ages civilization — Islamic civilization — Modern European civilization — New cities in the twentieth century.

UPL 301 CH URBAN SOCIOLOGY AND GEOGRAPHY

The course aims in its first part at introducing the student to different principles in urban sociology and the different factors that are involved in the needed social studies in the process of town planning. The second part deals with the study of the city: its form, Size, Site, Function, region, And its relationships with other urban entities on both the regional and the national levels.

UPL 302 CF TOWN PLANNING AND HOUSING (1)

The course introduces the student to the theoretical background that enables him to conduct the required studies for upgrading the urban environment — A field study project to deal with a deteriorating district where all the necessary steps are taken — The course also involves the definition of new towns and the theory of its formation and the study of its components: (Roads, Intersection, parking, . . .) — The housing curriculum aims at defining the housing problems in Egypt, teaching the design parameters for the neighborhood and applying it on the design of a residential neighborhood in one of the new towns.

UPL 303 CF URBAN DESIGN (1)

The course aims to teach theories of urban design and the roles and fields of urban design by studies concerning the space and its function with the surrounding environment — The social-

economical factors — Systems of urban design and land use by: Different spaces and their scales elements and factors of the urban environment, Spaces in old cities — Elements and components of urban design — Application on developing existing communities and new projects.

UPL 304 CH LANDSCAPING

The course aims at teaching landscaping — Its integration with architectural urban design on a building level and a group of buildings by using natural elements in landscaping — Natural designs to be used in the final design — Manufactured elements in landscaping and the methods of using them — Principles of external space design with applications to help in developing creative abilities for designing outdoor environments.

UPL 305 CH COMPUTER APPLICATIONS IN PLANNING

The course aims at teaching modern methods of building technology as it affects the speed and size of executed projects by study of: equipment used in different functions: Excavation, Moving and Lifting — Different methods in executing projects and storage with concentration on methods of site planning with Less cost-Less time by introducing the student to computer applications in different scopes: architectural design and working drawings information planning codes — Project management.

UPL 306 CH PROFESSIONAL PRACTICE AND LEGISLATION

The course introduces the student to the different aspects of the profession — The role of legislation on the planning projects through studying examples of legal problems that face the planner.

UPL 321 CF ARCHITECTURAL DESIGN

The course aims at developing the design abilities of the student in dealing with basic design problems through a housing project — A public building project with emphasis on the site limitations as an affecting factor in the design — The course also aims at teaching the student working drawing details: Drawing scales — Dimensions — Levels — Data — Finishing schedules — opening schedules. The student develops a project from the planning scale of a neighborhood to the architectural details.

UPL 322 CH ENVIRONMENTAL CONTROL

The course aims at training the student how to make an environmental analysis of a site — Suggesting different solutions for each site through practical exercises — The environmental factors affecting the site are analyzed — The environmental precautions that should be taken in the different design levels of the projects.

UPL 391 EH HOUSING ECONOMY

The course aims at teaching the student the economical perspective of the problems of housing in Egypt. The student is given detailed economical studies of the housing process.

UPL 392 EH ENVIRONMENTAL AND CULTURAL ELEMENTS IN *URBAN DEVELOPMENT*

The course aims at teaching the student the importance of the environmental and cultural characteristics of the community in handling planning projects for urban development and the consequences of neglecting them — Analytical studies of examples of different environments in the world.

UPL 393 EH ENVIRONMENTAL PLANNING

The course aims at introducing the strong interchangeable relationships existing between the urban and rural planning procedures and the environmental condition dominant in the

planning area on both the local and regional levels with the aim of teaching the student the basic elements and their components that affect the planning decisions.

UPL 394 EH GROWTH OF INFORMAL SQUATTER AREAS

The course aims at introducing-Handling the problem of the growth of informal squatter areas inside and on the outskirts of existing cities — It being a national-International problem facing all big cities-Capitals especially in the third world and that is implemented by teaching the different methods taken to face this problem in examples studied-Analyzed in developing countries.

UPL 395 EH NEW COMMUNITIES AND SETTLEMENTS

The course aims at studying-Analyzing applications in building new towns in the different cities of the world with focus on the Egyptian applications in building now town. The course includes comparative analysis for the application done in developing countries and the degree of their success in crardusting with the national's circumstances.

UPL 401 CH URBAN ECONOMY

The course aims at studying the economical basis of existing — New urban communities — Systems of their development in view of the economical potentialities and resources of these communities with feasibility economical studies concerning their development.

UPL 402 CH TOWN PLANNING (2)

The course aims at developing the student's abilities in town planning with emphasis on the economical-Social factors needed for the planning process. Analytical studies — Master plan for a new town — Study of housing projects — Urban design for its center — A research for on existing town.

UPL 403 CH URBAN DESIGN

The course aims at developing the students abilities in understanding human scale in space and the relation of its design and the urban structure with its users: Principles of human environment — relation of different city elements with the urban environment — Applications on developing new projects, Teaching the student the method of site analysis with respect to potentialities — Services and all the factors needed for completing the project.

UPL 404 CH FEASIBILITY STUDIES AND COST ESTIMATION

The course deals with the study of methods of economical feasibility studies for urban projects by teaching: site economy, Initial costs and running costs the economical profit, Marketing studies. The course aims at developing student's abilities in judging and choosing between alternatives.

UPL 405 CH PLANNING, LAW, AND LEGISLATION

The curriculum aims at teaching the student the building law and legislation; Their application by giving the student some examples for the legal problems that face the planner and surveying the legal solutions. The student has to pass a series of tests to assure successful application.

UPL 421 CH ARCHITECTURAL DESIGN

The course aims at developing the students design abilities through dealing with design problems on sites with certain potentialities-limitations — Emphasis upon urban integration with surrounding environment: A project with a special environment — A complex project (multifunctional different spaces).

UPL 450 CH PROJECT

The project aims at applying urban design basis in big projects of multi-elements and integration in their functions — With emphasis on practical developing projects — Developing project elements — Its components — Analytical studies for project site with respect to its relation with the region — Analyzing the environment — Topography with studies of functional relationships — Developing design levels — Designing the elements — Study of form and urban spaces to reach an urban integrated form.

UPL 491 EH PLANNING AND RURAL DEVELOPMENT

The course aims at the study of the basis and requirements of rural planning and its relation with regional planning role of rural communities and its development. This is done through: a historical survey of the growth and development of rural communities. Economical, Social, Political considerations for the rural areas with an application on a rural area in Egypt.

UPL 492 EH URBAN DEVELOPMENT IN DEVELOPING COUNTRIES

The course aims at introducing the student to some of the problems that face developing countries by analytical comparative studies for the urban development and the economical urban problems. A field study project is done to practice the methods of facing these problems.

UPL 493 EH CITY MANAGEMENT

The course aims at intruding the student to the different methods for city management from the administrative systems used in the different world cities especially the organization of construction work and laws — Services and infrastructure development constraints of cities and understanding for the different levels administrative responsibilities and the administrative working framework in the city.

UPL 494 EH INFORMAL HOUSING

The course deals with the study and analysis of the illegal and informal housing problem through a survey of examples done in other countries to face this problem. Focus is made on the national level and suggestions for different methods that should be used to faces this problem by social-Economical — Environmental studies for these squatter areas — The course also deals with housing laws — Legislation's to find the suitable methods to be used.

UPL 495 EH REGIONAL DEVELOPMENT AND PLANNING

The course deals with the relation between regional development projects in all scopes — The role of urban planning as a site constraint for the regional development projects of the country. The course also includes the study of the national-Regional policy for the development of industry — The upgrading of services and re-distribution to insure balance between the different of the city.

7- COURSES OFFERED BY THE DEPARTMENT OF ELECTRICAL POWER AND MACHINES ENGINEERING

EPM 100 CH ELECTROMECHANICAL ENGINEERING

Fundamentals of electric circuit theory — Ohm's law — Kirchhoff's laws — AC circuits — Polyphase systems — Electric motors: DC motors — Induction motors — fractional horsepower motors — Industrial and commercial applications: Construction engineering —

Petroleum industry — steel mills — Agriculture — Electric hoists — Electric elevators — Air conditioning — Refrigeration.

EPM 101 CH ELECTROMAGNETIC FIELDS

Vector analysis — Coulomb's law — Electric field intensity — Electric flux — Gauss' law — Divergence — Electrical energy and potential — Electric conductors — Electrical resistance — dielectric materials — Electrical capacitance — Electrical field plotting — Poisson's equation — Laplace equation — Steady magnetic fields — Ampere's law — Magnetic forces — Magnetic materials — Magnetic circuits — Inductance. Time varying magnetic fields — Maxwell's equations.

EPM 102 CF ELECTRICAL CIRCUITS (1)

Electrical circuit variables and elements — Simple resistive circuits — Analysis of electrical circuits — Source transformation — Network theorems — Star-delta transformation — Sinusoidal steady state analysis — Phasor diagram representation — Application of network theorems To Whom It May Concern: alternating current circuits — Electric power in alternating current circuits — Complex power calculations — Power factor — Circuits with nonlinear resistance.

EPM 103 CH ELECTRICAL ENGINEERING

The variables and constants of electrical circuits — Elements of electrical circuits — DC circuits — Network theorems — Sinusoidal alternating current circuits at steady state — Phasor diagram representation of sinusoidal quantities — Application of network theorems to alternating current circuits — Electric power in alternating current circuits — Power factor — Transients in electrical circuits — Magnetically coupled circuits — Inductance.

EPM 171 CH ELECTRICAL TESTING (1)

A set of laboratory experiments applied to the courses studied by the students in the first year — Electrical circuits: Applications on Ohm's law — Applications on Kirchhoff's laws — Series and parallel connections of electrical resistors — Applications of network theorems in DC circuits — Applications of network theorems in AC circuits — Electronics: Diode characteristics — Transistor characteristics.

EPM 200 CH ELECTRICAL INSTALLATIONS IN BUILDINGS

Safety merits and design fundamentals: supply of buildings with electrical energy — Distribution transformers — Stand-by generating units — Distribution panels — Control equipment — Electrical wiring ducts — Electrical wiring in buildings — Tools — Measuring instruments — Feeders — Fuses — Switches — Breakers — Earthing equipment — Artificial lighting: Types of artificial light sources — Lamp installations and operating conditions — Requirements of lighting in building spaces — Space specifications and lighting distribution systems — Technical steps of artificial lighting design — Exterior lighting — Special lighting systems and equipment.

EPM 203 CH ELECTRICAL CIRCUITS (2)

Transients in electrical circuits — Polyphase circuits — Magnetically-coupled circuits — Mutual inductance — Resonance in electrical circuits — Electric filters — Two-port networks — Locus of phasor diagrams at variable frequency — Analysis of electrical circuits with non-sinusoidal alternating currents — Higher harmonics — Fourier series.

EPM 204 CH ENERGY CONVERSION

Conventional methods of energy conversion: Introduction — Sources of energy — Electrical power systems — Electromechanical energy conversion: Conversion of electrical energy into mechanical and vice versa — Electric motors and generators — Faraday's law — Lorenz

forces — the basic electric generator — The basic electric motor — Continuous electromechanical energy conversion — Magnetically single excited systems — Magnetically multi-excited systems — Dynamic energy conversion equations — Conservative fields — Coupled magnetic fields — Torque and stored energy in magnetic fields — Coenergy and torque calculations — The reluctance machine — Multi-fed rotating systems — Electrostatic systems — Comparison between electrostatic and electrodynamic systems — Renewable methods of energy conversion: Solar energy — Solar cells — Batteries — Wind-energy generators.

EPM 205 CH ELECTRICAL MEASUREMENTS AND INSTRUMENTS (1)

Classification of electrical measurements — Measurement errors: Basic concepts and definitions — Accuracy — Types of errors — Statistical analysis. Classification and characteristics of measuring instruments: Static calibration — Resolution and precision — Loading effects — Impedance matching — Dynamic response — Units Systems — Dimensions and standards: Fundamental and derived units — Systems of units — Dimensional equations — standards — Electromechanical instruments: Moving-coil instruments — Moving iron instruments — Electrodynamics instruments — Induction-type instruments — Electromechanical instruments with transducers. Measurement of physical quantities: Current and voltage measurements — Measurement of power — Measurement of energy and electric charge — Measurement of frequency and power factor — Measurement of circuit parameters — Measurement of non-electrical parameters.

EPM 206 CH ELECTRICAL MEASUREMENTS AND INSTRUMENTS (2)

Cathode ray oscilloscopes: Construction — Control — Applications — Bridges and potentiometers: DC bridges — AC bridges — Power system measurements — Resistance measurements — Location of cable faults — Transducers: Strain gauges — Temperature transducers — Position and displacement transducers — Velocity and acceleration transducers — Force and pressure transducers — Light transducers — Capacitive transducers — Data converters: DAC — ADC —Voltage-to-frequency converters — Digital devices: digital voltmeters — Digital frequency meters — Errors in digital measurements, Basic calculations for digital voltmeter design.

EPM 210 CH ENERGY CONVERSION SYSTEMS

Electric transformers — Fundamentals of electromechanical energy conversion — Three-phase transformers — Three phase induction motors — three-phase synchronous machines — DC machines — Two-phase servomotors — Single-phase induction motors — AC tachometers — The synchros — Special electrical machines — Motor dynamics — Direct energy conversion.

EPM 211 CH ELECTRICAL MACHINES (1)

DC Machines: Theory and Design: Construction of DC machines — The generation of E.M.F. — Work — Power — Force -torque — The magnetic circuit of the dc machine — Armature windings — Armature reaction — Inductance — Energy in magnetic field — Commutation — Methods of improvement of commutation — Methods of excitation — Load characteristics of dc generators — Load characteristics of dc motors — Efficiency — Temperature rise — Testing of dc machines — — Design concepts — Main dimensions — Armature design — Design of poles — Design of inter-poles — Design of commutator — Calculation of efficiency — Examples on the design of dc motors and generators.

EPM 220 CH ELECTRICAL POWER AND MACHINES

Types of electrical machines: dc machines — Polyphase systems — Transformers — Induction machines — Synchronous machines — Fractional horsepower motors — Methods of selection of electrical motors — Control of electrical machines: Voltage control of generators — Traditional methods of speed control in electrical motors — Modern control techniques — Distribution of electrical energy: Distribution equipment — Underground cables — Types OF underground cables — Thermal characteristics of cables. Fundamentals of protection of electrical systems: protection of Electrical machines — Protection of transformers.

EPM 221 CH ELECTRICAL ENGINEERING

Fundamentals of electrical measuring instruments — Oscilloscopes and their applications — Three-phase systems — Transformers — Electrical generators and motors — DC machines — Synchronous machines — Induction motors — Fractional horsepower motors — Electric traction — Electric transportation — Transmission lines.

EPM 222 CH ELECTRICAL ENGINEERING (2)

Electrical quantities — Units — Conversion factors — Principles and equipment for measuring electrical quantities — Oscilloscopes and their applications — Power systems components — DC motors and generators — Three phase systems — Transformers — Induction motors — synchronous machines — Single phase induction motors — Fractional horsepower motors — Motor controls — Choice of motors for industrial applications — Industrial and commercial applications of electric energy — Electrochemistry and electrometallurgy.

EPM 223 CF ELECTRICAL AND ELECTRONIC ENGINEERING

Electrical measuring instruments — DC electrical current measuring instruments — DC electrical voltage measuring instruments — Electrical resistance measuring instruments — AC electrical measuring instruments — Oscilloscopes — Applications — Digital instruments — Electronic circuits — Semiconductor junctions — Rectifiers — Three-junction semiconductor devices — Transistors — Transistors as electronic circuit elements — Operational amplifiers — Application of operational amplifiers in electronic measurements and control — Signal generators — Electrical bridges and their applications.

EPM 251 CH DYNAMICS OF ELECTRICAL SYSTEMS

Introduction — Dynamics of electrical systems — Dynamics of mechanical systems — Mathematical models for mechanical systems — Analogy between electrical and mechanical systems — Writing system equations — Derivation of linear models — Derivation of mathematical models from experimental data — State variable approach — Control system components — Transform to frequency domain — Block diagram representation — Signal flow graphs — Stability criteria — Frequency response methods — BODE plots — Nyquist criterion — Root-locus method.

EPM 272 CF ELECTRICAL TESTING (2)

A set of laboratory experiments applied to the courses studied by the students in the second year — Electrical circuits: Magnetically coupled circuits — Electrical filters — Transients in electrical circuits — Operation with variable frequency — Electrical measurements and measuring instruments: definition of various types of electrical measuring instruments and their applications — Calibration of ammeters and voltmeters — Wattmeter connections and applications — Oscilloscopes and their applications — Energy conversion and electrical machine (1): Appreciation of the construction of electrical machines — A set of experiments

on dc machines — Elementary tests on transformers — Electronic and logic circuits: Tests on some integrated electronic circuits and chips — Tests on photovoltaic systems.

EPM 310 CH AUTOMOTIVE ELECTRICAL EQUIPMENT

Fundamental principles — The complete electrical equipment — The alternator and dc generator — The starting motor — The battery — Automobile lighting and signaling — Electrical ignition systems — Sparking plugs — Auxiliary equipment — Switches and switchgear — Wiring harnesses — Heating — Ventilation and air conditioning — Fuel injection equipment — Electrical control in automatic transmission systems — Radio interference suppression — Electromagnetic eddy current brakes.

EPM 312 CH ELECTRICAL MACHINES (2)

Transformers theory and design: Fundamental concepts of electrical transformers — Mutual inductance in electric and magnetic circuits — Power transformers — Phasor diagrams — magnetizing current and core losses — Equivalent circuits — Transformers at load: Efficiency — Voltage regulation — Three phase transformers — Three phase transformer connections — Three phase to two phase connections — Auto transformers — Voltage regulation in auto transformers — Tap changers for voltage regulation — On load tap changers — Higher frequency harmonics and three phase transformer connections — Transformers testing — Transformers design: Main dimensions — Magnetic cores — Transformer windings — insulation — cooling — Calculation of transformer characteristics — Examples on transformer design.

EPM 321 CH TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY (1)

General introduction — Representation of power systems — Parameters of transmission lines — Models of transmission lines — Series impedance — Electrical capacitance — Representation of capacitance in parallel with transmission lines — Voltage and current relationships in transmission lines — Operation characteristics of transmission lines — Symmetrical components — Unsymmetrical faults on transmission lines — Introduction to underground cables.

EPM 322 CH TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY (2)

Design of transmission lines — Mechanical design of transmission lines — High-voltage dc overhead transmission lines — Insulated electrical cables — Determination of faults in underground cables — Design of electrical distribution systems — Substations —Introduction to power system planning.

EPM 324 CH GENERATION AND ECONOMICS OF ELECTRICAL ENERGY

Load curves: Types of loads — Variation in demand — Load diversity and diversity factor — Power plant layout: Thermal power plants — Hydro electric plants — Diesel and gas turbine plants — Main equipment in each type — Auxiliaries — Bus-bar arrangements — Power plant economics: Capital cost — Operating cost fixed charge rate — Selection of plant — Plant size and unit size — Operation and spinning reserve economic comparison of alternatives — Tariffs: Different methods for charging the consumers — Effect of low power factor — Power factor improvement — Most economic power factor — Optimal operation of power systems: Modeling of fuel cost for thermal generation — Optimal operation of an all thermal system — Accounting for system losses — Optimal operation of hydro-thermal system — New energy sources: Solar energy — Wind energy — Other energy sources: Tidal — Geothermal.

EPM 330 CH ELECTRICAL POWER ENGINEERING

Introduction to electric power systems — Applications of high voltages in electric power systems — Overhead transmission lines — Underground cables — Generation of high voltage for test purposes — Methods of high voltage measurement — Electric insulation — Types —Corona. Earthing of electrical equipment — Safety — And resistance of earthing electrodes — Protection in power stations — Protection of sub-stations — Protection in transmission lines — Types of circuit breakers.

EPM 331 CH HIGH VOLTAGE ENGINEERING (1)

Introduction to the generation and transmission of electrical energy — Advantages and limitations of using high voltages for transmission — Generation of high alternating voltage for testing — Generation of high direct voltage for testing — Generation of high alternating voltage high frequency for testing — Generation of impulse waves — The impulse generators — layout and specifications of high voltage laboratories — The impulse generator — Measurement of high voltages — Insulators for transmission lines and substations — Insulator materials — Shapes of insulators — Different types of insulators — Factors affecting performance of insulators — Testing of insulator bushings — Destructive insulation tests — Non-destructive insulation tests.

EPM 332 CH HIGH VOLTAGE ENGINEERING (2)

Electrical breakdown in gases — Ionization and attachment coefficients — Towensend criteria — Steamer mechanism of spark breakdown — Pachen's law — Electro-negative gases — Electrical breakdown in liquids and solids — Corona discharge — Corona inception — Corona power losses — Corona radio interference — Applications — High voltage fields computational methods — Single and three-core cables — Electrical stresses in cables — Void formation — High voltage equivalent circuits — Insulation properties — Dielectric losses — High voltage cables — Thermal properties of cables — Current carrying capacities of cables — Earthing systems: Earthing electrodes — Safety and power earthing — Engineering and calculations of systems — Equipment for earthing resistance.

EPM 352 CH CONTROL OF POWER SYSTEMS (1)

Root locus compensation — Domain separation criterion — Cascaded and feedback compensation — Frequency response plots — Design of automatic excitation control and stabilization — Load frequency control — Liapunove's second method.

EPM 361 CH POWER ELECTRONICS

Introduction to power electronics — Power diodes and thyristors: Construction — Characteristics. Applications in rectifier circuits (converters) — Firing circuits — Power transistors as switches — Phase shift controls — Phase controlled rectifiers.

EPM 373 CF ELECTRICAL TESTING (3)

A set of laboratory experiments applied to the courses studied by the students in the third year : Electrical machines (2): Detailed tests on single-phase and three-phase transformers — Transmission and distribution of electrical energy — Tests on transmission line models — High voltage engineering : high voltage testing on electrical insulators of different shapes — Training of the students on handling, control, and using of high voltage equipment — Electric cables — Utilization of electrical energy: Applications of electrical energy — Electric traction motors — Power electronics (1): Experiments on converter circuit using diodes and thyristors.

EPM 381 CH UTILIZATION OF ELECTRICAL ENERGY

Electrical traction: Electrical traction systems — Mechanical and electrical characteristics of electrical traction systems — Speed curves — Operations during electrical traction — Motors for electrical traction — Modern control of electrical traction motors — Illumination: Artificial illumination requirements — Artificial Illumination characteristics — Standard specifications — Types of lamps and luminaries — Illumination curves — Installation of lamps — Luminaries and connections — Gas filled lamp ignitors — Electric heating: Means for electric heating — Resistance wires — Electric furnaces — Electric welding of metals: Arc welding, welding transformers, and welding generators — Spot-welding — Electrolytic processes: Metal-coating processes — Electric transportation : Cranes and hoists — Elevators — Conveyor belts — Paper and textile mills — Mining.

EPM 400 CF PROJECT

Under the supervision of the faculty members of the EPM department; A student or a group of studentsperform a detailed study on an electric system in the fields of specialization of the department. Students should perform analysis and design of a project in which they make use of the courses they have studied in their engineering program. The students, using laboratory facilities and/or computers, may prepare an experimental implementation, Or a prototype of the system. Every student or every group should hand in a detailed report. The report must include the formulation of the problem, methodology, mathematical treatment, design concepts and calculations ...etc. Computer programs and engineering drawings may be attached to the report.

EPM 413 CH ELECTRICAL MACHINES (3)

Induction machines; Theory and Design: Introduction — Construction of three-phase induction motors — The magnetic circuit. Types of windings in ac machines — Slip ring induction motors — Cage motors — Performance at constant flux — Electromotive force — Currents — Torque — Equivalent circuits — Torque speed curves — Phasor diagram representation — The circle diagram — Performance as induction generator — Starting methods — Classification of induction motors — High starting torque types — Effect of harmonics on the performance of three phase induction motors — The induction voltage regulator — Induction type phase shifter — Single phase induction motors: Construction and principle of operation — Methods of starting of single-phase induction machines — Fractional horsepower motors — Testing of induction motors — Mechanical details — Design of three-phase induction motors — The output equation — Selection of the main dimensions — Standard frames — Windings — Power factor — Specific loading — Design examples.

EPM 414 CH ELECTRICAL MACHINES (4)

Synchronous machines theory and design; Introduction — Cylindrical-rotor synchronous machines — Salient-poles synchronous machines — Performance as synchronous generators — Performance as synchronous motors — Phasor diagrams in three-phase synchronous machines — Synchronous impedance under steady state operating conditions — Voltage regulation — Parallel operation — Connection of synchronous machines to an infinite bus bar — The synchronization process — The V curves — Power angle characteristics — The two-reaction theory — Open circuit characteristics — Short circuit characteristics — Potier reactance — Zero-power-factor characteristic — Damper bars — Testing of synchronous machines — Transient reactance and time constants construction — Design of synchronous machines — Power and main dimensions — Specific loading — Selection of fundamental dimensions — Examples on the design of turbo-generators — Examples on the design of low speed generators.

EPM 415 EH GENERALIZED THEORY OF ELECTRICAL MACHINES

Elements of the generalized theory: The basic two-pole machine, Kron's primitive machine. Linear transformations — Power invariance — Rotating axes of reference — Three phase frame of reference — Transformation between different systems of reference — Torque equations — Restrictions — Applications of the generalized theory — DC machines: Steady state and transient operation — Cross-field generators — Electrical braking — Polyphase synchronous machines: Parameters of synchronous machines — Steady state analysis — Transient analysis — Dual-excited synchronous machines. Polyphase induction machines: Transformations — Steady state performance — Transient analysis — Special modes of operation —Single-phase motors —Revolving field theory — Starting. AC commutator machines — Transformers.

EPM 416 EH SPECIAL ELECTRICAL MACHINES

Theory of single phase rotating machines — Two phase motors — Single phase induction motors — Windings and connections — Split phase induction motors — Capacitor start motors — two value capacitor motors — Shaded pole motors — Drag cup motors — Linear motors — Synchronous motors — Reluctance motors — Hystresis motors — Permanent magnet motors — Inductor type motors — Stepper motors — DC motors — Universal motors — DC special purpose motors — Variable speed drive systems — DC servomotors — Selecting motors for required operations.

EPM 425 CH POWER SYSTEM ANALYSIS (1)

Symmetrical components: Synthesis of unsymmetrical phasors from their symmetrical components —The symmetrical components of unsymmetrical variables — Power in terms of symmetrical components — Positive, Negative, And zero sequence networks — Unsymmetrical faults: Shunt faults — Series faults — Network matrices: Network topology — System admittance matrices — System impedance matrices — Load flow solutions and control: Load flow equations — The Gauss-Seidel method — Newton-Raphson method and approximations — Decoupled methods — Regulating transformers.

EPM 426 CH POWER SYSTEM ANALYSIS (2)

Transient phenomena in electrical systems: Types of transient processes — Equivalent circuits of power system elements — Multi-machine linear systems — Maximum power and loading limit — Modeling of basic elements of electrical systems: Vector diagram representation — simplified systems — Excitation and speed control systems — Block diagram representation — Simplified criteria of transient stability in limited electrical systems: Concept of transient stability — Equal area criterion — Numerical solutions of rotor electromechanical equation — Steady state (dynamic) stability of electrical systems: Analysis of uncontrolled systems — Design of power system stabilizers — Analysis of controlled systems — Voltage stability of loads and electrical power systems: Criteria of load and voltage stability — Voltage collapse in electrical power networks.

EPM 427 EH PLANNING OF ELECTRICAL NETWORKS

The utility perspective — Utility financial accounting — Economic evaluation: Utility economic evaluation methods — Fixed charge rate - Total annual fixed charge rate — Revenue requirements — Pay back method — Financial and regulatory analysis — Corporate financial simulation — Regulatory incentive — Utility incentives — Industrial power generation economics: Cogeneration overview — Steam turbine cogeneration cycles — Gas turbine cycles — Cogeneration regulations — Generation planning: Generation planning methodology — Manual generation planning — Automated generation planning: Dynamic programming concepts — Approximate techniques — Capacity resource planning —

Integrated demand; supply planning — Marginal costs — Small improvement projects — Planning under uncertainty — Bulk power transmission planning : Transmission planning methodology — Steady state transmission system models — Transmission planning examples.

EPM 428 EH COMPUTER APPLICATIONS IN POWER SYSTEMS

Introduction — Power system matrices: Incidence and connection matrices — Bus admittance matrix — Bus impedance matrix — Loop matrices — Programming considerations: Sparsity programming — Power flow studies: Methods and practical applications — Approximate, Fast, and Special purpose power flow studies: The decoupled power flow study — Distribution factors — Transportation methods — Optimal dispatch: Methods — Automatic generation control — Fault studies — Modeling of some power system components — Application of some ready made packages.

EPM 433 EH High Voltage Applications

Phenomenon of over-voltages in power systems — Wave propagation over lines and equipment — Theory of traveling waves and standing waves — Electrostatic field of extra-high voltage (EHV) lines — Lightning and lightning protection — Over Voltages in EHV systems caused by switching operations — Insulation characteristics of long air gaps — Power frequency voltage control and over-voltages — EHV testing and laboratory equipment — Design of EHV lines — Design examples.

EPM 441 CH SWITCHGEAR AND PROTECTION ENGINEERING

Switchgear engineering: circuit breakers types — Construction — Performance and ratings — Interruption of fault currents and arcs in circuit breakers — Circuit breaker test oscillograms — Circuit breakers synthetic and direct tests — Switching over-voltages — Resistance switching — Capacitance switching — Protection engineering : Introduction — Effects of short-circuits on power systems — Basic elements of protective gear — Current and potential transformers — Protective relays — Electromechanical and static relays — Different types of electromechanical relays — Types of protection in electrical power systems — Differential protection of power systems — Protection of ring main systems — Protection of parallel feeders.

EPM 442 EH APPLICATIONS IN SWITCHGEAR AND PROTECTION SYSTEMS

Item protection: Protection of generators — Protection of transformers — Protection of bus-bars — Protection of transmission lines — Carrier protection— Protection against over-voltages — Protection schemes — Substations — Power stations — Protection of low-voltage systems: (Fuses — M.C.C.B. — M.C.B.) — Coordination of protective devices — Over-voltage transients and traveling waves — Surge velocity — Surge impedance — Surge power and energy stored. Terminations: Incident — Reflected and transmitted waves — Applications — Over-voltage protection: surge diverters — Insulated neutral systems over-voltages protection — Earthing systems: Earthing electrodes — Safety and power earthings — Engineering and calculations of systems and equipment earthing resistance.

EPM 443 EH POWER SYSTEM PROTECTION

Protection relaying philosophy and fundamental considerations — Transmission line protection — Short lines — Medium length lines — Long distance power transmission — Compensating distance relaying — Rotating machinery protection: Relay protection for ac generators — Loss of field relay operation — Power transformer protection — Relay-input sources.

EPM 453 CH CONTROL OF POWER SYSTEMS (2)

Mathematical modeling of the sampling process — The Z transform — Transfer functions — Block diagrams and signal flow graphs — Time domain and Z domain analysis — Design of discrete data control systems for electric power systems and machines — Introduction to microprocessor control of electric power systems.

EPM 454 EH ADVANCED CONTROL OF POWER SYSTEMS

Central operations: Operation of power systems — Organization and operator activities — Control center experience — Supervisory and control functions: Data acquisition — Monitoring and event processing — Control functions — Reports and calculations — Man-machine communications: Operators duties — Mimic diagram functions — System structures: Subsystems, System classes — System interactions, performance and reliability considerations: Performance criteria — Software considerations — Hardware considerations — Databases — Technical realization: Central system — Communication system — System maintenance — Application fundamentals: real time network modeling — Security — Training — Control system examples.

EPM 462 EH APPLICATIONS IN POWER ELECTRONICS

AC voltage controllers: The single phase ac thyristor controller — Three phase controller — Phase control of AC controllers — Integral cycle control — Thyristor commutation techniques: Natural commutation — Forced commutation — Main principles — Circuits — DC choppers : The single thyristor chopper — Two thyristor choppers — Inverters: Single phase circuits — Bridge inverter circuits — DC drives — AC drives.

EPM 463 EH ELECTRIC DRIVES

Basics of industrial motor control — Criteria for selecting drive components — DC motor drives — Equivalent circuit of dc motors — Permanent magnet dc motors — DC servomotors — Adjustable speed dc drives — Industrial examples — Electric traction examples — Induction motor drives — Slip power recovery from an induction motor — Forced commutation — Variable frequency ac motor drives — Injection braking of induction motors — Synchronous motor drives — Stepper motor drives — Computer controlled drives.

EPM 464 EH ANALYSIS OF POWER ELECTRONIC SYSTEMS

Electronic switches — Commutation — Line commutated converters — Converters — Load commutated inverters — Self commutated inverters — Control circuits — Main circuit components — Filters — Protection of thyristors — Series and parallel operation — Gate firing systems — Cooling and construction — Measurement and testing with thyristors — Measuring of electrical parameters in thyristor equipment — Testing and commissioning.

EPM 474 CF ELECTRICAL TESTING (4)

A set of laboratory experiments applied to the courses studied by the students in the fourth year: Electrical machines: detailed tests on single-phase and three-phase induction machines — Three-phase synchronous machines — Measurement of the power angle in synchronous machines — Measurement of synchronous machine parameters. Power system analysis: Experiments on analog and/or digital models of power systems. Power electronics: Inverters — Voltage regulators. Switchgear and protection engineering: definition of different types of protection relays — Circuit breakers.

EPM 491 EH MICROPROCESSOR APPLICATIONS IN POWER SYSTEMS

Digital computation and systems — Characteristics of microprocessors — Microprocessors as components in engineering systems — Real time processing — DC motor control: Open

loop control — Speed control — Position control — DC motor testing — AC generators excitation: Types of excitation systems — Application of microprocessors for excitation control — Speed control of generator prim. movers — Industrial AC motor control — Application of microprocessors for inverter and converter control — Programmable logic controllers for AC motors.

8- Courses offered by the Department of Electronics and Electrical Communications Engineering

ECE 130 CH ELECTRICAL MATERIALS

Crystals: Crystal lattices — Miller indices — Crystal directions and planes — Crystal growth — Epitaxial growth — Energy bands and charge carriers in semiconductors : bending forces and energy bands — Charge carriers in semiconductors — Carrier concentrations — Drift of carriers in electric and magnetic fields. Excess carrier concentrations in semiconductors: Optical absorption, Luminescence, Photoconductivity —Carrier lifetime. Diffusion of carriers — Applications (Phototransistors — Solar cells — Lasers — Leds — Etc...). Dielectric materials — Under static fields: Static dielectric constant — Polarization and dielectric constant — Ferro-electricity, spontaneous polarization — piezoelectricity — Dielectrics under alternating fields: frequency Dependence of electronic polarizability — Ionic polarization as a function of frequency — Dielectric losses. Magnetic materials: Dipole moments microscopic bases for magnetic polarization, Diamagnetism and paramagnetism — Ferromagnetism. Thermal effects: Thermoelectricity — Thermo-magnetic effects — Superconductivity — The josphson junction.

ECE 131 CH ELECTRONIC ENGINEERING (1)

Overview of energy bands — Carrier concentration and carrier transport phenomena. Junction diodes and their characteristics and applications — Bipolar devices: Transistor action — Static and dynamic characteristics — The thyristor. Unipolar devices: Metal-semiconductor contacts — The junction field effect transistor (JFET) — MOS diode — MOSFET basic characteristics — Photonic devices: Radiative transitions and optical absorption — Light emitting diodes (led) — Semiconductor lasers, Photo-detectors, Solar cells — Laser characteristics and accessories — Low-power and high-power laser applications — Integrated circuit technology : crystal growth and epitaxy — Oxidation and film deposition — Diffusion and ion implantation — Lithography and etching — Integrated devices.

ECE 221 CH ELECTRICAL MEASUREMENTS

Oscilloscopes — Storage and sampling oscilloscopes — Probes and connectors — Digital voltmeters — Testing of linear systems — Impedance measurement — Frequency and time measurement — Phase measurement — Transducers — Spectrum analyzer — Power measurement — Automated measurement systems — Data acquisition — Recording techniques.

ECE 232 CH ELECTRONIC ENGINEERING (2)

Review of transport phenomena in semiconductors — Generation and recombination mechanisms — High field effects — P-N junction (High injection effects — Switching performance) — Ebers-Moll model — Gummel Poon model — BJT small signal model — High frequency effects — Applications in power conversion (Thyristors — Diacs — Triacs) — Bipolar device simulators — noise in devices.

ECE 241 CH ELECTRONIC CIRCUIT (1)

Transistor model — DC and small signal transistor models — Basic transistor amplifier circuits; The CE — The CB — The CC — the CG and the CD. The transistor biasing and dc operating point — Biasing stabilization — Amplifier classifications and characterization — Analysis of audio frequency amplifier RC — Coupled amplifiers.

ECE 242 CH ELECTRONIC CIRCUIT (2)

Audio frequency power amplifiers — Different classes of amplifiers — Feedback amplifiers — stability — Operational amplifiers — Instrumentation amplifiers — Isolation amplifiers — BiFET and BiMOS amplifiers — Linear and nonlinear applications; Regulated power supplies — Schmidt trigger — Computational analog circuits — Oscillators — Relaxation oscillators.

ECE 243 CH DIGITAL CIRCUITS (1)

Binary numbers — Boolean algebra and minimization — Combinational circuit design — combinational logic function implementation — MSI combinational logic circuits — Decoders — Demultiplexers — Multiplexers — Programmable logic arrays — Read only memory — binary Addition circuits — Multiplication.

ECE 244 CH ELECTRONIC AND LOGIC CIRCUITS

Op-amps for linear and nonlinear applications — Graphical and piecewise linear methods for large signal applications — Equivalent circuit and small signal analysis — Frequency response — the BJT switch — Analysis of transistor transistor logic (TTL) gates — The MOS switch — Analysis of CMOS gates.

ECE 245 CF ELECTRONIC CIRCUITS

Introduction to electronic systems — Time domain — Transients and steady state — Impulse response — Step response — Diodes and applications — Bipolar junction transistor (BJT) — BJT models and applications — Junction field effect transistor (JFET) — JFET and MOSFETs — transistor amplifiers — Frequency response — Feedback amplifiers — Oscillators — Power amplifiers — Operational amplifiers and its applications — Logic circuit families memories — Analog ICs.

ECE 251 CH DIGITAL COMMUNICATIONS SYSTEMS

Introduction; Number systems — Some simple codes — Matrix operations — Principles of probability — Spectral analysis — The Channel: Memory-less channels — Bandwidth considerations — Distortion — Telephone lines — Noise. Coding of Analog Information: Sampling — Pulse code modulation — Data modulation — Alternative Forms of modulation. Coding of Data Signals : Information theory introduction — Measure of information — Channel capacity — Block encoding — Convolution codes — Cyclic codes — General Transmission Characteristics: Timing consideration — Multipath, Matched filters — Elements of Decision theory — Multiplexing Network protocols — Introduction to MODEMS — Base-Band Systems: Base-Band systems — Inter-symbol interference in Base-Band — Base-Band Equalization — Performance — Binary matched Filter detector — M-Ary Base-Band. Amplitude Modulation: Modulators and Demodulators — Performance. Frequency Modulation: FSK, Modulators and Demodulators — Phase-Lock-loops — performance. M-Ary FSK — Phase Modulation: PSK — Modulators and Demodulators — Performance — Quadrature PSK.

ECE 261 CH FIELD THEORY

Electromagnetic theory: Maxwell's equations — Continuity relations — Power and energy — Wave equation — Wave velocities — Lorentz reciprocity theory — Plane wave

propagation — Poynting vector — Propagation in matter — Reflection and diffraction: Frensel equation — Hygen's principle and optics — Geometrical optics concept — Transmission lines: TE — and TM waves — Field equation in TL— Distributed parameters equation of TL — Power flow on TL — Smith chart and impedance matching — Theory of small reflections — Power and energy relations.

ECE 262 CH ELECTROMAGNETIC WAVES (1)

Guided waves: Waves between two conducting parallel plates — TE and TM waves and their characteristics — Velocities of propagation — attenuation and quality factor — Wave impedance — Basic closed wave-guides: TE and TM waves and their characteristics in rectangular wave-guides — Wave solution in cylindrical coordinates — TE and TM waves in circular wave-guides — Attenuation and quality factor of the wave-guide — Boundary perturbation (elliptical boundary) — Dielectric planar wave-guides: surface Waves — Modes of TE and TM waves in planar dielectric guide — Symmetric and asymmetrical slab — Power propagation in the guide — Confinement factor — Dispersion in the guide — Optical fiber: the field analysis of the step index fiber — The dispersion relation, Hybrid modes EH and HE, Cutoff relations — The linearly polarized modes — Mode group number and propagation constants — Power propagation in the hybrid modes — Bulk material dispersion of silica — Analytical derivative of single mode dispersion in SI fiber — Dispersion in multi-mode fibers — Fiber bandwidth — Characteristics of single mode fiber — Its propagation constant — Design of parameters — Attenuation in fibers.

ECE 272 CF ELECTRICAL TESTING (2)

The student performs testing measurements in two domains: Electronic circuits: BJT and FET amplifier characterization — Logic circuits — Transistor hybrid parameters — Analog and digital circuit simulation (SPICE) — Multi-vibrator — Operational amplifiers and its applications — oscillators — Feedback amplifiers — power amplifiers — Active filters — Power supplies circuits. Communication systems: AM and FM modulation — AM and FM transmitters — AM and FM receivers.

ECE 333 CH ELECTRONIC DEVICES

JFET and MESFET — MOS capacitors — MOSFET static and dynamic performance — short channel and narrow channel effects — Scaling theory — Non volatile memory devices (floating-gate MOSFET) — Power MOSFETs — Field effect device simulators (MINIMOS) — Modern MOS technology and fabrication.

ECE 334 CH OPTICAL ELECTRONIC

Interaction of radiation and atomic systems — Theory of laser oscillation: Fabry-Perot laser, Oscillation — Frequency — Power output — Some laser systems — Electro-optic modulation of laser — OPTO-electronic semiconductor devices — DC. and AC characteristics — PIN and avalanche photodiodes — Applications: OPTO isolator types — Parameters and characteristics — circuit applications — Solar cells — LCD's.

ECE 345 CH DIGITAL CIRCUITS (2)

Sequential logic components — Flip-flops — Shift registers — Counters — Timing circuits — Sequential logic analysis and synthesis — Analysis and synthesis using state status — Algorithmic state machine — Storage systems: RAM, ROM, Bubble memory devices, CCDs — Programmable devices and systems — The programmable logic controllers — Data transmission and conversion — Synchronous and asynchronous transfer.

ECE 352 CH ELECTRICAL COMMUNICATION ENGINEERING

Spectral analysis; Fourier series — Fourier transformation — Correlation between waveforms — Random variables and processes — Amplitude modulation (AM) systems — AM

demodulators — frequency modulation (FM) systems — FM generation — FM demodulators — Digital modulation techniques; BPSK — QPSK and M-ary PSK — Minimum shift keying MSK — Noise in AM systems — Noise in FM systems.

ECE 353 CF COMMUNICATION SYSTEMS (1)

Introduction — Distortion of signal transmission — Analog transmission — pulse transmission — Digital transmission — Linear modulation — Frequency conversion — Detection — Frequency division multiplexing — Exponential modulation — FM spectral analysis — Transmitters and receivers — Sampling and pulse modulation — Time division multiplexing — Common broadcasting systems.

ECE 354 CH SIGNAL PROCESSING

Signals and systems — Sampling theory — Linear time invariant systems — Interconnected systems — L.T.I. system response — Frequency response and filters — Frequency response-graphical methods — Geometrical algorithms — Graphical design of filters — Z-transforms — Inverse Z-transforms — Discrete Fourier transforms — Stochastic processes — Convolution — Correlation — Spectral analysis.

ECE 363 CH ELECTROMAGNETIC WAVES (2)

Equivalent circuit of wave-guides: N-port circuit, Circuit description, Scattering parameters — Excitation of wave-guides — Wave-guides coupling by aperture — Passive devices: Terminations — Attenuators — Phase shifters — Directional couplers — Hybrid junctions — Circuit theory of resonators — Fabry-Perot and optical resonators — Microwave and optical measurements: Detection of optical power — Detection and measurement of microwave power — Measurement of wavelength — Measurement of impedance — Fiber parameter measurements.

ECE 372 CF ELECTRICAL TESTING (3)

The student performs testing measurements in two domains. Communication systems: study of digital communication techniques — TV characterization — Receiver systems — Telephone system and semiconductor devices.

ECE 373 CH MICROPROCESSORS AND APPLICATIONS

Introduction to microprocessors — Architecture — Microprocessor hardware — Assembly language fundamentals — Programming — Microprocessor system connections — Timing in microprocessors — Interrupts and interrupt service procedures — Microprocessor timing specifications — Interfacing — Programmable Chips — Data Acquisition systems — Applications of closed loop control — I/O hardware alternatives — Developments tools — Troubleshooting case studies.

ECE 411 EH INTEGRATED CIRCUITS TECHNOLOGY

Technology evolution — Crystal growth and wafer preparation — Epitaxy — Oxidation — diffusion — Ion implantation — Polycrystalline film deposition — Metalization — Lithography — Process simulation.

ECE 412 EH ANALOG ARTIFICIAL NEURAL NETWORKS

Neurons — Neuron model — Types of networks — Analog vs. digital ANNs — Transconductance amplifiers — Arithmetic functions implementations — Aggregation of signals — Follower/integrator circuits — Differentiators — Axons — Typical system examples.

ECE 413 EH COMPUTER AIDED ELECTRONIC DESIGN AND MANUFACTURE

CAD techniques — CAD equipment — CAM techniques — CAM systems — CAT techniques — CAT systems — Emerging technologies and CAE.

ECE 414 EH COMPUTER INTERFACING CIRCUIT DESIGN

Timing — Serial/parallel I/O — Pipes and filters — Analog signal conversion — Interface components and techniques — Signal processing and SNR enhancement — Interface systems and standards — Communications.

ECE 415 EH APPLICATION SPECIFIC INTEGRATED CIRCUITS (ASICS)

Standard component VS. Silicon manufacture (Single chip VLSI) implementation — Manufacturing technology — Layout design and interfacing to silicon foundry — Full custom vs. semicustom design approaches — Standard cells — Gate arrays (Mask programmable and field programmable) — Silicon compilers — Constraints and unsuitable technique for ASIC design — testing ASICs — CAD tools.

ECE 416 EH ANALOG INTEGRATED CIRCUIT DESIGN

Signal conditioning — Voltage and current references — Voltage VS. Current modes of operation (Transconductance amplifier) — Nonlinear computational circuits — Pseudoanalog techniques — switched capacitor and switched resistor filters — Phase locked loops and applications — Mixed analog digital circuits — Mixed mode simulation — Behavioral simulation (VHDL).

ECE 417 EH ELECTRONICS FOR INSTRUMENTATION

Parameters of practical op amp. — Extended operation of op amps — Op amp selection — Four quadrant multipliers — Waveform generators — Voltage to frequency and freq. to voltage converters — Precision rectifiers and logarithmic converter — Design of active filters — PLL — Timing circuits — A/D and D/A converters — DAS — Power management circuits.

ECE 418 EH INTEGRATED OPTICS

Introduction — Modal analysis of open wave-guides: Modes of open wave-guides, Modal expansion and normalization — One Dimensional wave-guide analysis: Symmetric and asymmetric slab wave-guide, Multi-Layer wave-guide analysis — Graded index wave-guide — The W.K.B. Method and Techniques for the analysis of two Dimensional wave-guides: The effective index method (EIM) — generalization — Modification and corrections of EIM — Comparison with other techniques — Analysis of transistors and components: Coupled mode theory — Beam propagation method — Characterization of integrated optical components: Loss measurement, Refractive index measurement — Fabrication techniques: Review of classical integrated circuits techniques — Ionic exchange technique on glass substrate.

ECE 419 EH INTEGRATED CIRCUITS APPLICATIONS

Amplifiers: RF, IF and video — Oscillators: Tuned and untuned, Oscillators stability — VCO, Phase locked loop — Modulators: AM — SSB balanced FM — PM Pulse modulators — Digital modulators — Demodulators: AM, FM And PM detectors — Transmitter and receiver circuits — Circuit simulators — Digital — Analog and mixed mode.

ECE 435 CH MICROWAVE ELECTRONIC ENGINEERING

Microwave electronic tubes: klystron — Velocity modulation — Bunching — Reflex klystron — efficiency — Traveling wave amplifiers — Wave modes — Microwave characteristics — Backward wave amplifiers — microwave crossed field devices — magnetrons, M-Carcinotrons — Principle of operation — Characteristics — Parametric amplifiers: varactors — Manley-Rowe relations — Parametric up-converters — Negative resistance parametric amplifiers — Transferred electron devices: Gunn-effect diodes — Operation — Modes — Microwave generation and amplification — Avalanche transit time devices: avalanche multiplication — IMPATT diodes — Trapatt devices — Power output and efficiency — Design of microwave semiconductor amplifier and oscillators: design considerations — Design examples.

ECE 455 CH COMMUNICATION SYSTEMS (2)

Digital communication systems — Baseband system design — Digital modulation ASK — FSK and PSK — Noise — Noise phenomena — Receiver noise — System noise calculation — Bandpass noise — Repeater systems — Noise in CW modulation — Interference — Noise in linear modulation — Noise in exponential modulation — Comparison of CW modulation systems — Noise in digital systems — Matched filters — Errors in digital systems — Regenerative repeaters — Introduction to information theory — Some examples of communication systems — Satellite communication systems — Mobile communication systems.

ECE 456 CH TELECOMMUNICATION NETWORKS

Introduction — Transmission principles — Transmission media — Lines and radio — Four wire circuits — Crosstalk — Transmission systems — Switching systems — Space switching — Time switching — Signaling and call establishment — Number plan — Routing plan — Charging plan and signaling plan — Exchange systems — Call establishment — Call termination — Teletraffic engineering — Unit of telephone traffic — Traffic measurement — Lost call systems — Queuing systems — Overflow systems — Data transmission over the public telephone network — Private data networks — Public data networks — Error detecting and correcting codes — International standards.

ECE 464 CH ANTENNAS

Communication with radio-wave — Fundamentals of electromagnetic radiating antenna and antenna impedance: Some basic antenna parameters — Dipoles, Arrays and long wire antenna — Biconical antennas — Folded dipole antenna — Baluns — Array pattern synthesis: Feed network for arrays — Phased arrays — Aperture type antenna — Application of field equivalence principles to aperture radiation — Open wave-guides and horn antennas — Receiving antennas: reciprocity theorem and effective area for antennas — Antenna noise temperature — Propagation: surface wave propagation — Ionospheric propagation — Microwave and millimeter wave propagation — Introduction to microstrip antenna.

ECE 474 CF ELECTRICAL TESTING (4)

The student performs testing measurements in two domains: Communication systems: study of PLL characteristics — Study of digital communication techniques; PCM — Delta modulation — Optical communication systems — TV characterization — Satellite receiver systems — Telephone system. Electromagnetic waves: Propagation of radio wave — Microwave generators — Semiconductor devices — Characterization of microwave circuits.

ECE 481 CH INTEGRATED CIRCUITS

IC processing — Post processing — and processing economics — Layout rules — Design of basic digital IC building blocks — NMOS and CMOS gate circuits — GaAs digital circuits — IIL — TTL — ECL gates — BiCOMS digital circuits — Design of basic analog IC building blocks — Operational and transconductance amplifiers- Phase locked loops and oscillators.

ECE 490 CF PROJECT

The student choses one project from the following topics: Integrated circuits (VLSI) — Electronic systems — Communication systems — Optical communications — Integrated optics — Microwave circuits — Microwave medical and industrial applications — Microwave communication link — Radar systems — Mobile receivers — Satellite systems — Antennas and propagation — Computer interfacing circuits — Computer aided design CAD — Computer aided testing CAT — 0000 Instrumentation systems.

ECE 491 EH DIGITAL SIGNAL PROCESSING

Discrete Fourier transform FFT, Z Transform — Digital Filters — Adaptive filters — Applications of adaptive filters — Echo cancellers and suppressors — Digital signal processing of speech — Digital image processing — Applications of digital signal processing to radar — Sonar signal processing — Digital signal processing in Geophysics.

ECE 492 EH SATELLITE COMMUNICATIONS

Communication satellite systems — Orbiting satellites — The satellite channel — Satellite electronics — Frequency division multiple access — Time division multiple access — And code division multiple access — On Board processing.

ECE 493 EH MOBILE COMMUNICATIONS

Introduction — Effect of Mobility on communication systems — VHF and UHF propagation in Land — Mobile communication — Assessment of deterministic propagation models — Empirical results for deterministic propagation model — Probability of signal outage — Threshold crossing rate and average fade/nonfade duration — Average bit error rate in mobile channels with cochannel interface — Random Multiple access to mobile radio channels — Spatial distributions in mobile slotted ALOHA Networks — Design and planning of cellular voice networks — Performance of digital cellular Networks.

ECE 494 EH DATA COMMUNICATIONS

Messages and switching — Layering — Physical layer — Data link layer — Network layer — Transport layer — Session layer — Presentation layer — Application layer — Delay models in data networks — Multi — access communication — Slotted multi — Access — Carrier sensing — Multi — Access reservations — Packet radio networks — Radio in data networks — Flow control — Examples of data communication networks — Internetworking — Integrated services digital network.

ECE 495 EH PERSONAL COMMUNICATIONS AND MOBILE SYSTEMS ANTENNAS

Fixed site antennas — The radio communication channel — Communications using earth orbiting satellites — Radio test sites — Radio-wave propagation practice — Waves in multipath propagation — Measuring receiver sensitivity — General view of antennas systems for mobile communications — Essential techniques in mobile antenna systems design — Land mobile antenna systems — Basic techniques and applications — Antenna for mobile satellite systems — Antenna systems for aeronautical mobile communications.

ECE 496 EH RADAR SYSTEMS

Radar fundamentals — Physics and overview of electromagnetic scattering — Exact prediction techniques — High — Frequency RCS prediction techniques — Phenomenological examples of radar cross section — Radar cross section reduction — Radar absorbing materials — Radar absorber measurement techniques — Antenna RCS and RCSR — RCS measurement requirements — Outdoor RCS test ranges — indoor RCS ranges — High — Pocket RCS estimation — Data presentation and reduction.

ECE 497 EH OPTICAL COMMUNICATION SYSTEMS

Overview of optical fiber communications — Optical fiber power launching and coupling — Optical receiver operation digital and analog — Detectors and preamplifiers — Digital transmission systems — Point to point links — System considerations — Power and rise time budgets — Analog systems — Carrier to noise ratio — Multi-channel transmission techniques — Coherent optical fiber communication — WDM multiplexing.

ECE 498 EH INFORMATION THEORY

Basic concepts of probability — Bay's theorem — Random variables — Memory-less finite schemes — Properties of entropy function — Set theory interpretation of Shannon's fundamental inequalities — Redundancy — Efficiency and channel capacity — Entropy of a Markov source — channel capacity — Elements of encoding — Shannon-Fano encoding — Fundamentals theorem of discrete noiseless coding — Continuous channel — Gaussian noisy channels — Fundamental theorem of continuous memory-less channels — Error correcting codes — Convolutional codes — block coding.

9- COURSES OFFERED BY THE DEPARTMENT OF COMPUTER AND SYSTEMS ENGINEERING

CSE 010 CH INTRODUCTION TO COMPUTERS

Introduction to data processing: Introduction to the world of computers — Computer system and its elements — Data organization and entry — Computer system fundamentals — Input/Output media and devices — Processing and storage devices — Microcomputers — Problem preparation and problem solving concepts: Flow-charting — Decision tables — Top-down program design — Introduction to computer languages and programming. File and database concepts.

CSE 120 CH NUMERICAL COMPUTING ANALYSIS

Introduction: Using software packages to find approximate solutions of algebraic and transcendental equations — Using software packages to perform matrix operations and solve systems of linear algebraic equations — Computer methods to solve systems of nonlinear equations — Interpolation of functions — Numerical integration — Computer methods to solve ordinary and partial differential equations — Finite elements — Case studies of typical engineering applications — Using standard packages e.g. MATLAB or similar.

CSE 201 CF MEASUREMENT AND ELECTRICAL TESTING

Introduction: Measurement and error — Accuracy and precision — Significant figure — Statistical analysis — Types of error — Systems of units of measurements — Standards of measurements. Direct current indicating instruments — Suspension galvanometer — DC ammeter — and DC voltmeter. Alternating current indicating instruments — Electro-dynamometer — Moving coil instrument — Rectifier-type instrument — Frequency meter — Instruments transformers. DC Bridges and their applications; Whetstone bridge — Kelvin

bridge — Oscilloscopes. Electronic instruments: Electronic voltmeters — Electronic multimeter — Differential voltmeter — Digital voltmeter — And Q meter — Instruments for generating and analyzing waveforms — Oscillator — Pulse and square wave generators — Signal generators — Function generators — And wave analyzers. Lab work will be included to support all theoretical aspects of the course material.

CSE 202 CH LOGIC DESIGN

Introduction to Logic Circuits: Basic logic elements — Technologies and levels of operation — Boolean algebra and Switching theory — Representation and manipulation of switching functions — Realization of switching functions — Minimization of switching function — Combinational Logic Circuits: Multiplexers and demultiplexers — Decoders and encoders — Adders and subtracters — Carry look-ahead — Comparators — Programmable logic arrays and Read Only Memories — Design with MSI — Sequential Logic Circuits: Finite state machines — Descriptive techniques — Analysis of synchronous and asynchronous circuits — Design of synchronous sequential circuits — sequential functional unit — Design with MSI.

CSE 210 CH PROGRAMMING PRINCIPLES

Program Development: Declarations — Coding — Debugging — Program testing — Data Packaging: Arrays — Records — Sets — Files — Choosing Data Structures — Stacks: Definition and operations — Array implementation of stacks — Application: Reverse polish calculator — Translation into postfix form — Queues: Definitions — Implementations of Queues — Circular Queues — Application of queues: simulation. Lists and strings: Operations on lists — implementation of lists — strings, Application: A text editor — Linked Stacks And Queues: Dynamic memory allocation and pointers in Pascal — The basic linked lists — Linked stacks — Linked queues — Abstract data types and their implementations — Linked Lists: Simply linked implementation of lists — Doubly linked lists and other variations — Application: polynomial arithmetic — Linked lists in arrays.

CSE 212 CH COMPUTER ORGANIZATION (1)

Basic computer organization — Central Processing Unit organization — Arithmetic and Logic Unit; stack organization — Control Unit — Instruction formats — Addressing modes — Instruction set — Micro-programmed control unit — Control memory — Address sequencing — Micro-program sequencer — Micro-instruction formats — Input/Output organization — Peripheral devices — I/O interface — Asynchronous data transfer — Direct memory access — Priority interrupt — I/O processor — Memory organization — Auxiliary memory — Memory hierarchy — associative memory — Virtual memory — Cache memory — Memory management hardware — Bus organization — Microprocessor organization.

CSE 218 CH COMPUTER ENGINEERING

Introduction to computers-evolution — Programming and architecture — Hardware and firmware — Computer software — Basics of computer architecture — Computer instruction set: Op-code encoding — Addressing modes— Instruction types — Reduced Instruction Set Computer (RISC). Execution unit: ALU design — Bit-slice processor — Control unit: Hardware control design — Micro-programmed control unit — Memory organization: Characteristics of memory devices — Main memory design. Input/ Output: Programmed I/O — Standard versus memory-mapped I/O, Interrupt I/O.

CSE 220 CH SYSTEMS ENGINEERING

Evolution of systems science and its historical development — Systems movement and its relation to cybernetics — Operations research — System analysis — And system engineering. Conceptual Frameworks: Deductive and inductive approaches epistemological hierarchy of

systems with applications in different domains. Systems methodology: General systems problem solver — Systems modeling — And methodological role of the computer — Goal-oriented systems : Adaptive systems — Special types of goal-orientation — Applications: Computer-based systems — Communication systems — Industrial systems — Economic and socioeconomic systems.

CSE 221 CH PROCESS DYNAMICS

Modeling principles and simulation; methodology for model building — Modeling of distributed systems — Modeling of process dead-time — Experimental approach to model building — Linearization techniques — Modeling of chemical process plant — Heat exchanger — Binary distillation column — Chemical reactor — Iron making and steel making; models. Turbo-generators in electric power systems — nonlinear mathematical model — Generator — Exciter — And transmission system — Boiler and turbine. Manufacturing systems — Mechanization and automation — Numerical control — Computer-aided manufacture — Illustrative examples. Simulation of physical systems.

CSE 222 CH CONTROL COMPONENTS

Open loop versus closed loop controls (Examples of industrial control loops). Transducers — Transducers specifications — Static specifications — Dynamic specifications — Position transducers; potentiometers — LVTD — Optical encoders — Synchros. Strain transducers; strain gauge — Whetstone bridge circuit. Velocity transducers; Electromagnetic linear velocity transducer — DC electromagnetic tachometer — Permanent magnet AC tachometer — Temperature transducers; thermocouple — RTD thermometer — Signal conditioners and transmission; instrumentation amplifiers — Zero and span circuits — Conversion circuits; voltage to current — Current to voltage — Voltage to frequency — Analog controllers; error amplifier — ON/OFF controllers. Data acquisition; analog to digital converters — Digital to analog converters — Errors. Programmable controllers; Hardware overview — Ladder diagram — Power interfacing; Power operational amplifier — Thyristor-based power interfaces; thyristor devices — Thyristor triggers — Proportional power circuits.

CSE 229 CH NUMERICAL COMPUTING ANALYSIS

Introduction — Using software packages to find approximate solutions of algebraic and transcendental equations — Using software packages to perform matrix operations and solve systems of linear algebraic equations — Computer methods to solve systems of nonlinear equations. — Interpolation of functions — Numerical integration — Computer methods to solve ordinary and partial differential equations — Finite elements — Case studies of typical engineering applications — Using standard packages e.g. MATLAB or similar.

CSE 301 CF INDUSTRIAL MEASUREMENTS AND TESTING

Information and signal processing — Types of measurements and instrumentation specification — Intelligent instrumentation. Temperature measurements; Force and weight measurements — Weight measurements elastic transducers — Torque measurements — Pressure measurements; Flow measurements; Velocity measurements — Digital transducers — Digital encoders — Selected digital transducers. Analog signal conversion — Digital to analog conversion — Analog to digital conversion — Converter characteristics. Instrument technology; design and construction of instruments — Reliability — And safety. Automatic instruments and measuring systems. A lab work supports the experimental part of the course to cover experiments on industrial instrumentation schemes and modules.

CSE 312 CF COMPUTER ORGANIZATION

Basic concepts: System design processes and approaches. Virtual machines — System performance. Instruction set design — A minimal instruction set — Reduced Instruction Sets

(RISC). Arithmetic processor design and algorithms — Parallelism with single instruction stream — Tightly-coupled process specifications — Array architecture — Pipeline architecture — Systolic arrays — Parallelism by message passing — Data flow systems — Implementation of data flow systems. Shared resource synchronization — The architecture of a basic shared memory system. Sharing in high-level languages — Sharing implementation with correct cooperating processes. — checks for unauthorized access attempts. Memory addressing to support sharing. Processor support for shared resource synchronization — Implementation of processor object sharing features; Secure systems — System design options for secure systems. Hardware support for secure system implementation.

CSE 313 CH COMPUTER NETWORKS (1)

Introduction: The use of computer networks — Network structure, Network architecture — The ISO reference model — examples of networks — Network Topology: Formulation of the problem — Connectivity analysis — Delay analysis — Backbone design, Local accesses network design. The Physical Layer: The theoretical basis for data communication, The telephone system — Transmission and multiplexing — Terminal handling — Errors. The Data Link Layer: Elementary data link protocols — Sliding window protocols — Examples of the data link layer— Analysis of protocols.

CSE 314 CH COMPUTER HARDWARE DESIGN

Introduction to digital electronics — Bipolar transistor inverter and logic gates — Overview of logic types: TTL gates — Emitter-coupled logic — And integrated injection logic — Metal-Oxide Semiconductors (MOS): Characteristics and limitations — NMOS — CMOS — Dynamic logic circuits — Regenerative logic circuits: Bistable circuits — Latches and flip-flops — Schmidt trigger — IC timers — Semiconductor memories: ROM— Static RAM — Dynamic RAM — IC power considerations — Central Processing Unit — CPU timing — Physical and electrical characteristics — Microcomputer hardware design.

CSE 315 CH SYSTEMS PROGRAMMING

Overview of System Programming — Assemblers: Basic functions — Machine-dependent and machine-independent assembler features — Assembler design options — Implementation details and examples — Loaders and Linkers: Absolute and bootstrap loaders — Relocation, Program linking — Automatic library search — Linkage editors — Dynamic linking — Bootstrap loader details — Implementation details — Microprocessors: Macro definition and expansion — Recursive macro expansion, General-purpose macro processors — Implementation details — Text Editors and Word processors: Overview of the editing process — User interface — And Editor structure — Debugging Systems: Functions and Capabilities — User interface criteria, Implementation — Other System Software: desktop Publishers — Windows.

CSE 316 CH OPERATING SYSTEMS

Introduction. Operating system structures: System components — Operating system services — System structure — Virtual machines — System design and implementation — System generation — Concurrent Processes: Process concept — The producer/consumer problem — The critical section problem — Semaphores— Language constructs— Interposes communication— CPU Scheduling: Scheduling concepts— Performance criteria— Scheduling algorithm. memory management: Multiprogramming with fixed partitions— Multiprogramming with variable partitions— Paging — Segmentation. secondary storage management: Physical characteristics— Device directory — Free space management — Allocation methods — Disk scheduling— File Systems: File concept — Access methods— Directory systems File protection.

CSE 317 CH SOFTWARE ENGINEERING

Introduction: The software process — Software evolution— And software reliability — Software specification and system modeling: The software — requirements document— Requirements evolution — System contexts — Viewpoint analysis — Model description— Real-time system modeling — Data modeling — Requirement definition and specification: The prototyping process — prototyping techniques — Formal specifications — Algebraic specification — Model based specification. Software Design: Top-down design — Systems design— Design decomposition— Software design quality— Design description languages— Object Oriented Design — Functional Oriented Design: Data flow diagrams— Structure charts— Data dictionaries— Deriving structure charts— A design example— Concurrent systems design— User Interface Design.

CSE 318 CH ALGORITHMS AND DATA STRUCTURES

Algorithms — Searching: Introduction and notation— A lower bound for searching. Sorting: ordered lists— Insertion sort— Selection sort— Shell sort— Low bounds— Recursion: Examples of recursion— Binary trees— Binary search trees— Principles of recursion: Tail— When not to use recursion. Further sorting methods divide and conquer sorting — Merge sort of linked lists — Quick sort for contiguous lists — Heaps and heap sort — Contiguous implementation of binary trees — Comparison of methods. Further Applications of recursion. Backtracking — Postponing the work — tree-structured programs — look-ahead in games — compilation by recursive descent. Further Structures and Algorithms— Tables: introduction— Breaking the LG(N) barrier— Rectangular arrays— Tables of various shapes— A new abstract data type — Radix sort— Hash tables: choosing hash function— Collision, Analysis of hashing— Comparison of methods— Graphs: mathematical background— Computer representation— Graphs as data structures.

CSE 319 CH OPERATING SYSTEMS

Introduction — Time management: Goal measures and assumptions— Policies— Perspective— Space management: Swapping storage hierarchies — Physical and virtual storage — Address translation — Sharing — Fixed partition — Segmentation — Paging— Page-replacement policies — Resource Deadlock: Deadlock and starvation — Deadlock detection — Deadlock recovery — Transputer (I/O): Device hardware — The device interface — Device drivers — Data modification — The process interface — File structures: Naming structure of files — Access methods — File recovery— Translations — Physical representation — The user interface: The command interpreter — interactive programs — Utility programs — Concurrency: The problems — Mechanisms.

CSE 321 CH SIGNAL ANALYSIS

Introduction— Discrete Systems: Z-transforms — Recursion equations — And Finite order systems — Fourier Analysis: Fourier transform — Line spectra and Fourier series — Discrete Fourier series and fast Fourier transforms. Continuous Systems: Moment expansion and spectrum analyzers — Filters — Finite order systems — Digital Processing of Analog Signals: Sampling and Interpolation — Mean square approximations —Digital simulation of analog systems — Nonrecursive filters — Recursive frequency-domain filtering, Factorization — Windows — Hilbert Transforms: Analytic and asymptotic properties of Laplace transform — The factorization problem — Windows and extrapolation — Hilbert transforms.

CSE 322 CH CONTROL SYSTEM (1)

Characteristics of closed loop systems: Introduction to feedback control system — Advantage and disadvantages of feedback — Sensitivity to parameter variation — Performance of control systems: standard test signals — Transient response, Response of

first and second order system — Properties of transient response — Stability of linear systems — The Routh-Hurwitz criterion. The Root Locus Method: Frequency response plots — Bode plots — polar plots — Systems with transportation lag — Estimation of transfer functions from Bode plots — Stability from frequency response: nyquist criterion — Relative stability — And the closed loop frequency response — systems with pure delays. Design and compensation of control systems: Typical compensators — approaches to compensation — Compensation using root locus — Compensation using Bode plots — Nichols charts — And pole-placement PID controllers.

CSE 323 CH CONTROL SYSTEM (2)

Introduction to Computer Control. Sampling theorem and Z-transform — Reconstruction of sampled signals. Time and frequency domain Analysis of discrete-time systems — Open-loop discrete systems — Closed-loop systems — System time-response characteristics — Stability analysis of discrete-time systems — Design of digital controllers — Pole-assignment design and state estimation — Linear quadratic optimal control. Microprocessor implementation of digital filters — Finite word length effect — Case studies. State space analysis and time domain analysis of control systems. Robust control for linear systems and sensitivity analysis — Lyapunov stability analysis. Non-linear control systems — Phase-plane analysis. Describing function analysis. Controller design for systems containing non-linear elements.

CSE 325 CH MICROPROCESSOR — BASED SYSTEMS

An Overview of microprocessor architecture: Internal organization — Data unit — Buses — Control units — Timing — Sequences and synchronization. Assembly language programming: Instruction set — Assembler directives — I/O device — Interface Design: I/O control method — I/O synchronization — LSI and MSI interface devices — Interrupt Processing: Priority interrupt — Vectored and non-vectored interrupts — Peripheral devices: Keyboard and displays. Data Acquisition subsystem design. Mass storage devices — Microprocessor in automation systems — Microcontrollers.

CSE 327 CH AUTOMATIC CONTROL

Modeling of some physical: Electrical — Mechanical — Electromechanical — Thermal — Hydraulic — Systems — Open and closed system — Block diagram — Transfer function — Block diagram reduction — Signal flow graphs. Static variable models — Transient response analysis: First- — Second — Higher-order systems — System classification and static error constants— Stability of linear feedback systems — Routh stability criterion — Root Locus Analysis — Frequency Response Plots From pole-zero plots — Bode diagram — And polar plot — Nyquist analysis Mapping — Nyquist stability criterion — Gain and phase margins — Design approaches of feedback control systems Phase-lead — Phase-lag.

CSE 328 CH COMPUTATIONAL METHODS IN ELECTRICAL ENGINEERING

Computation of algebraic equations (Electric circuits applications) — Solution of differential and integral equations (Electric power systems) — Statistical methods (load forecasting) — Fourier transform — Harmonic analysis — Applications using ready made packages.

CSE 401 CF ELECTRICAL TESTING

Experiments at this level cover the following: Computer architectural concepts — Computer interfacing techniques — Data communication and computer network protocol testing — Electronic instrumentation concepts — Robotics and Artificial Intelligence applications — Analog and digital — non linear control systems — Control system testing — Computer

control of industrial processes. Experimental projects are given to the students to implement hardware/software modules.

CSE 411 CH COMPUTER INTERFACING

Introduction to I/O organization of a typical computer — Computer peripherals interfacing (input and output devices) — Microcomputer ports: Serial — Parallel — Mouse — I/O Multiprocessing interfacing — Interprocessor communication schemes. Human-computer interface in virtual Reality — A generic virtual reality interfaces for real applications — Optical computing devices. Intelligent interface machines — Embedded systems.

CSE 412 CH ARTIFICIAL INTELLIGENCE

Intelligence in humans and machines — Basic issues in AI — Introduction to AI languages — Features of A.I — Programming languages — Difference between conventional and A.I programming. Basic search techniques — Heuristics and game playing — State space representation and AND/OR graphs. Automated reasoning — Computational linguistics — And natural language processing — Knowledge representation — Design considerations for knowledge representation systems — Types of knowledge representation — Production systems — Expert systems and applications — Computer vision — Introduction to neural networks and fuzzy systems — Machine translation — Intelligent tutoring systems. Robotics.

CSE 413 CH COMPUTER NETWORKS (2)

The network layer: Virtual circuits — Routing algorithms — Congestion — Satellite packet broadcasting — Packet radio — Local networks: carrier sense networks — Ring networks — Shared memory systems — The transport and session layers: Transport protect design issues — Interconnection of packet-switching networks — The session layer — Examples of transport and session layers — The presentation layer: network security and privacy — Text compression — Virtual terminal protocols — File transfer protocols — Examples of the presentation layer. The application layer: Distributed database systems — Distributed computations — Network and distributed operating system.

CSE 416 CH COMPUTER PERIPHERALS

Input Devices: Introduction — Human factor considerations — Keyboards — Digitizers and input tablets — Mice — Track-balls and joy-sticks — Voice input systems — Output Display Devices: CRT — LCD — Gas — Plasma displays — Controllers — Software support — Output Hard copy Devices: Plotters — Impact printing — Line and matrix— Non-impact printers — Electro-photographic — Magneto and ionographic — Thermal — Ink-jet— Color printing — Printer controllers — Mass storage devices: Semiconductor (Flash), Magnetic Floppy — Hard disk — magnetic tapes Standard — Cartridge — Optical — CD-ROM — WORM — Magneto-optical. Multimedia and virtual reality devices: Head-mounted displays — Data gloves.

CSE 418 CH DATABASE SYSTEMS

An overview of database management: What is a data base system — Operation data — Data independence — relational systems and others — An architecture of a data-base system: the three levels of architecture — the external level — the conceptual level — the internal level — mappings — the database administrator — the data-base management system. the internal level: database access — page sets and files — indexing. hashing — Pointer chains — Comparison techniques — An overview of DB2: Relational databases, The SQL language — Major system components — Relational algebra: A syntax for the relational algebra — Traditional set operations — Special relational operations — Relational calculus: Tuple-oriented relational calculus — Relational calculus VS — relational algebra — Domain-

oriented relational calculus — Query-by-examples. data definition: Base tables — Indexing. Data manipulation: the system catalog — View: View definition — DML operations and view — Logical data independence — advantages of views — Embedded sql: dynamic SQL — Database environment: Recovery and concurrence security and integrity.

CSE 421 CH SIMULATION OF ENGINEERING SYSTEMS

Basic simulation modeling. nature of simulation — System — Models and simulation — Discrete-event simulation — Simulation of a single server queuing system — Simulation of an inventory system — Modeling complex systems — List processing in simulation — Simulation languages — Simulation of a time sharing system — Review of probability and statistics — Random variables and their properties — simulation output data and stochastic processes — Estimation of means — Variances and correlation — Confidence intervals and hypothesis tests for the mean — Building valid and credible simulation models — Principles of valid simulation modeling — Verification of simulation computer programs — General perspectives on validation — An approach for developing valid and credible simulation models — practical considerations: Random number generators.

CSE 423 CH ADVANCED INDUSTRIAL CONTROL

Introduction — Calculus of extremes and single-stage decision processes — Variational calculus and continuous optimal control — The maximum principle and Hamilton-Jacobi theory — Optimal systems control examples — Discrete variational calculus and the discrete maximum principle — Systems concepts. Linear programming and optimal control of discrete systems — Nonlinear programming techniques — Dynamic programming techniques and applications. AI in process control: An overview intelligent supervisory control and optimization — Intelligent simulation — Intelligent operator of decision support — Knowledge engineering and project organization.

CSE 425 CH INDUSTRIAL CONTROL

Dynamic elements in the control loop (Dead time — Capacity — Lag) — Characteristics of real processes — Nonlinear elements in the loop — Analysis of some common loops (Flow control loop — Pressure control loop — Liquid level control loop — Temperature control loop — Composition control loop). Controllers — Including linear controllers (PI — PID — Complementary feedback controller) — Digital control systems — nonlinear controllers (On-Off controller — the dual mode concept — nonlinear PID controller). Improved control through multiple loops — Including cascade control — Multiple output control systems — Selective control loops and adaptive control systems. Feed-forward control — Ratio control — Dynamic compensation — Effects of interaction — Decoupling.

CSE 491 CF PROJECT

The general aim of the project is to allow each student integrate all the disciplines he has studied in a unified piece of knowledge. On the behavioral side — Students are allowed to work in a team so as to practice working in a collaborative environment. Since any engineering endeavor should result in a well planned — Executed — And maintained system — An important aspect of the project is to let the students is trained in following a scientifically-based engineering methodology for the project implementation. This emphasizes also a proper documentation and presentation procedure. On the technical side — Students are allowed to choose among a number of projects suggested by the different staff members. The topics of these projects usually reflect the unified educational policy of the department and are usually related to different subjects in the curriculum.

CSE 451 EH EXPERT SYSTEMS

Introduction: Knowledge-Based expert systems — Conventional programming versus Knowledge Engineering — Examples of expert systems: MYCIN — DENDRAL — XCON — Human problem solving: Human information processing — The production system as a processing model — Problem solving — Varieties of knowledge — The nature of expertise — Representation of knowledge: An informal look at a knowledge base — Strategies for representing knowledge — Semantic networks — Object-attribute-value triplets — Rules — Frames. Representing facts and relationships using logic — Drawing inferences: Inferences control — The future of representation and inference — languages and tools: Levels of software — The languages-tool continuum — AI languages and environments — Knowledge engineering tools — expert shells — building a small knowledge system: The role of small systems — Building a small expert system — How large knowledge systems are developed — Knowledge engineering — Knowledge system development. Selection of an appropriate problem — Development of a prototype system — Development of a complete expert system. evaluation — Integration and maintenance of the systems.

CSE 452 EH COMPUTER GRAPHICS

Introduction to computer graphics: History — Applications — Interactive graphics system — And graphics system software — Drawing elementary figures: plotting points — Aspect ratio — Line drawing — Circle drawing — Ellipses — Graphics fundamentals: Display screen viewing — window to view port mapping — Clipping — Color — Elementary shading techniques: Rectangular shading —Geometric images — Circular shading — Two-dimensional geometric transformation: translation — Rotation — Scaling — Shearing — Inverse transformation — And matrix representation. Display file segmentation: display file — Segmented display file — Segment table — Operations on display file segments — Techniques of interaction: input devices — Cursor motion, Building techniques, Painting. animation: speed consideration, Paddle techniques — Path look — Up table — Collision — Programming examples — Three dimensional graphics.

CSE 455 EH NEURAL NETWORKS

Introduction and a historical review: Overview of neurocomputing — History of neurocomputing — neural network concepts: Basic definitions — Connections — Processing elements — Learning laws: Self-adaptation equations: Coincidence learning — Performance learning, Competitive learning — Filter learning — Spatiotemporal learning. Associative networks: data transformation structures: Linear associative network — Learn matrix network — Recurrent associative networks — Mapping networks: Multi-layer data transformation structures: The mapping implementation problem — Kolmogorov's theorem — The back-propagation neural network — Self-organizing map — counter-propagation network — Spatiotemporal — Stochastic — And hierarchical networks: Saptiotemporal pattern recognizer neural network — The boltzmann machine network — The neocognitron network. neuro software.

CSE 456 EH OPERATIONS RESEARCH AND MANAGEMENT SYSTEMS

Quantitative decision-making. Classical deterministic models. The standard linear programming model: The simplex method, Integer and zero-one programming, Allocation problem — dynamic programming — Inventory models — Replacement — Maintenance — And reliability problems — queuing models. Routing problems and networks — Simulation. Stochastic processes — Heuristic programs — Decision analysis — Project management — Pert techniques — Computer methods for project management — Scheduling — Modified scheduling and resource analysis.

CSE 460 EH COMPUTER SECURITY

Overview: Characteristics of computer intrusion — Points of security vulnerability — Methods of defense — Basic encryption and decryption: Different types of ciphers — Characteristics of good ciphers — Crypt analysis. Secure encryption systems: hard problems and complexity — properties of arithmetic — Public-key systems — Single-key systems and the data encryption standard — Appropriate use of encryption — Enhancing cryptographic security — Security involving programs: Information access problems — Viruses and worms — Controls against attack — Operating system control — Administrative controls — Design of secure operating systems: Models of security — penetration of operating systems — Examples of security in general purpose operating systems. database security: reliability and integrity— Sensitive data — The inference problem — Multilevel data security — personal computer security: Computer network security and communication security.

CSE 461 EH MACHINE LEARNING SYSTEMS

Overview of machine learning: Taxonomies based on: The underlying learning strategy — The type of knowledge acquired — And the domain application — A framework for learning — Black box learning methods: Pattern recognition — Parameter adjustment — The perceptron — pandemonium — The boltzmann machine — Signature tables with different examples — Learning structural descriptions: The description language — Learning as searching — Quinlan's ID3 — AQ11 — Induce — Meta-dendral — Aspects of learning: Learning from examples — A methodology for inductive learning. Learning in problem-solving and planning: Learning by analogy — learning by experimentation — learning from observation and discovery: Role of heuristics in learning by discovery — Learning from observation — Applications of machine learning: Application in information retrieval and expert systems.

CSE 462 EH DISTRIBUTED COMPUTER SYSTEMS

Overview of distributed computing: Architecture for distributed systems — User's view of distributed computing — Distributed operating systems for computer networks — Distributed databases — distributed problem solving — Foundations of coordinated computing models: Shared variables — Exchange functions — Concurrent processes — Data flow and petri — Nets — communicating sequential processes, Actors, Indeterminate applicable programming. Distributed operating systems for computer networks: processor management and scheduling techniques — Communication and synchronization — Languages for distributed computing: basic elements of ADA — Occam or other available languages — distributed databases: Problem solving: cooperation structures for solving problems — Examples

CSE 465 EH LOCAL AREA NETWORKS

Introduction to local computer networks: Definition and functions — Network structure and topology, Channel access techniques — Network traffic — Performance measure — Performance of basic access protocols: Fixed assignment access methods, The aloha random access procedure — Idealized central control — Comparison of basic capacity assignment strategies — Polling networks: Operation of polling strategies — Performance analysis — Performance of polling networks — Ring networks: token ring, Slotted rings, Register insertion rings — And comparative performance of ring networks — Random access networks: basic properties of random access networks, Slotted aloha — Protocols, Collision detection. Protocols and network architecture: The ISO reference model — IEEE 802 standards, Local network architecture — Inter- Networking. IEEE 802 bus networks.

CSE 467 EH COMPUTER VISION

Digital image and its properties — Image digitization — Digital image properties — Data structures for image analysis — Levels of image data representation — Traditional image data structures — Image pre-processing — Pixel brightness transformations — Geometric transformations — Image restoration — Object Orientation — Knowledge representation — Neural nets — Recognition as graph matching — 3D Vision — Line labeling — Shape from X — Approaches to the recognition of 3D objects — Depth map technologies — Image transformations — Fourier transform — Hadamard transform — Discrete cosine transform — Applications of discrete image transforms — Image Data Compression — Image data properties — Discrete image transforms in image data compression — Predictive compression methods — Vector quantization — Comparison of compression methods.

CSE 469 EH SELECTED TOPICS IN COMPUTERS

Selected topics related to current developments in computer engineering. New computer architecture — New software engineering paradigms like object orientation — Multimedia and virtual reality systems — Geographic information systems — Intelligent information systems — embedded real — Time applications — Concepts in machine translation and natural language understanding — New mass — Storage devices and other peripherals.

CSE 471 EH REAL-TIME SYSTEMS

Basic real-time systems: Basic computer architecture — Some terminology — And real-time design issues — Examples of real-time systems — Language issues: Language features — Commonly used programming languages — Language support and restrictions — Verification and validation of real-time software — The software cycle — Real-time specifications and design. Real-time operating systems: properties of real-time operating systems — Real-time kernels — Intertask communication and synchronization — Allocation and scheduling: Real-time memory management — Scheduling algorithms — Heuristic approach in scheduling — Verification of schedulability — System performance analysis and optimization — Queuing models — Reliability testing and fault tolerance — Multiprocessing systems — Hardware/software integration.

CSE 472 EH PATTERN RECOGNITION IMAGE PROCESSING

Scope of Pattern Recognition: Numerical — Syntactic or structural — Components of numerical pattern recognition system: Process description — Feature analysis — Classifier design — And cluster analysis — Process description: syntactic — Numerical — Contextual — Fuzzy — rule based — Feature analysis: preprocessing — Features extraction — classification: Bayes decision theory — Two-category classification — Classifiers — Discriminate functions — And decision surfaces — The bayes classifier — Clustering: Applications — Scope and applications of image processing — Image representation: the spatial frequency domain — Descriptions of line and shape. perspective transformations — Projective invariant — descriptive methods in scene analysis — Applications.

CSE 473 EH Special Control Circuits

Power Diodes: Construction and characteristics ratings — leakage current — series and parallel operations — Thyristors: SCR construction and characteristics — SCR Trigger circuits and turn off circuits — triacs and diacs unijunction transistor and programmable unijunction transistors — SCR parallel and series operation. Phase - Controlled Rectifiers — AC line voltage control — DC link inverter and its controls — Control of DC and AC motors — Introduction to programmable controllers: Electromechanical control systems — programmable logic controller — Programmable controller hardware — Relay ladder

diagram and programming — PLC system operation and logic programming techniques — Computer numerical control — Installation — Troubleshooting.

CSE 474 EH INTELLIGENT CONTROL SYSTEMS

The evolution of expert systems — Knowledge-based control systems. Notion of fuzzy rule-based expert systems: Software and hardware aspects — Neural-network-based control systems — Computational neural architecture for control applications — Intelligent sensory — Applications of intelligent control in engineering disciplines.

CSE 475 EH BIOMEDICAL SYSTEMS

Mathematical modeling of physiological systems: Introduction — Linear system approximation expressions — Block diagram representation and simplification — A brief introduction to stochastic modeling — Cardiopulmonary system models: Myocardial mechanics — Distributed parameter models — Model performance — Cardiac energy and power analysis models — Models of gastrointestinal tract motility: Mechanical events — Electrical activity — and Motor activity — Models of respiratory mechanics and chemical control of respiration: Lumped and distributed parameter models — Vibration of the model parameters with pathological condition with applications in COPD.

CSE 476 EH ROBOT SYSTEMS

Introduction — Robot arm kinematics: The direct kinematics problems, The reverse kinematics solution and Robot arm dynamics — Planning of manipulators trajectories: Job-interpolated trajectories, General considerations and Control of robot manipulators — Robot programming languages: Characteristics of robot-level language and Characteristics of task-level language — Robot intelligence and task planning: Robot learning, Task planning, Expert systems and knowledge engineering in robot's applications.

CSE 479 EH SELECTED TOPICS IN CONTROL

Elements of linear system theory — Elements of probability theory — Stochastic processes. modeling : Computer oriented mathematical models, Process oriented models — Disturbance models. Properties of linear stochastic systems — Optimal prediction and filtering — Optimal smoothing — Optimal estimation — Stochastic optimal control. Identification: parameterization of system models — The principle of least squares — Recursive computations — Adaptive control: model-reference adaptive control — Self-tuning control — Stochastic adaptive control — Auto-tuning — Gain scheduling .

10- COURSES OFFERED BY THE DEPARTMENT OF DESIGN AND PRODUCTION ENGINEERING

MDP 011 CF ENGINEERING DRAWING

The use and maintenance of drawing instruments — Conventional lettering and dimensioning — Theories of view derivation — Engineering projections — Derivation of Views form Isometric Drawings and vice versa — Derivation of views and sections from given views — Symbols of Electrical Circuits.

MDP 012 CH PRODUCTION TECHNOLOGY

Introduction to Engineering materials: Ferrous, Non-ferrous, Polymer, Ceramics and composites — Introduction to manufacturing processes: Casting, Welding-Forming processes and Machining processes — Concepts and terminology of industrial engineering: Work study, Production planning and control and Industrial organization and economy — Computer applications in production engineering.

MDP 101 CF MACHINE DRAWING

Methods used in drawing and designing offices — Kinds of drawings — Positioning of dimensions — Views of sections — Parts of normal machines — Drawing parts of machines.

MDP 102 CH MACHINE AND FORMING TECHNOLOGY (1)

Introduction to machining processes — Description of the following machines with the various operations that can be performed on each and the methods of holding both the cutters/tools and workplaces and description of the mechanisms used in the machine tools on each: Lathe, Drilling machines, Milling machines, Shapers and planers and Slotters and saws — The machining allowance in the above machining processes — The process time in each case — The types of cooling liquid used —Introduction to metal forming processes — Description of the various operations of forming — Different types — Description of the machines and tools used for each type of forming operations and defects that may occur for the following operations: Forging — Rolling Extrusion — Wire and tube drawing — Deep drawing — Stretch forming — Ironing — Metal spinning — Sheet metal forming.

MDP 103 CH ENGINEERING MATERIALS (1)

Substance structure-crystallography — Mechanism of metal solidification — Thermal equilibrium binary alloy diagrams Iron-carbon diagram — No equilibrium conditions — Engineering alloys and their properties: Ferrous alloys, heat treatments of steel-carbon, steel and alloy steel-cast iron-non ferrous metals and alloys: Copper, aluminum, magnesium and titanium — Powder metallurgy — Polymers-structures-types-properties — Ceramic materials-structure-types-main properties — Composite materials.

MDP 104 CH ENGINEERING MATERIALS (2)

Mechanical behavior of materials: Elastic and plastic deformation of metals — Single crystal and polycrystals — Static and dynamic behavior in tension — Static and dynamic behavior in compression — Static and dynamic behavior in bending — Shear and torsion behavior — Hardness properties — Impact properties — Wear resistance — Fracture mechanics: Brittle-ductile, and fatigue fracture — Creep behavior of materials — Physical properties Introduction — Electrical — Magnetic and thermal properties — Chemical properties: Introduction, Electrochemical corrosion, Oxidation, Corrosion and oxidation control.

MDP 201 CF APPLIED MECHANICS (1)

Mechanisms: Definitions, Inversions of reciprocating engine, Inversions of double slider mechanism, Motor vehicle steering mechanism, Hook's joint, Velocity and acceleration — Equilibrium of machines and force analysis: Static and Power-analysis, Friction and Inertia-effect, Center of percussion, Flywheel and turning moment diagram — Cams: Types of cams, Types of followers, Motions of follower, Cam profile and Motion of follower — Gears: Types of gears, Gear geometry and Gear train, Balancing: Introduction, Balancing of rotating masses, Balancing of the reciprocating engine and Engine out of balance — Gyroscope.

MDP 202 CF MACHINE CONSTRUCTION

Power transmission — Clutches: Mechanical, Electromagnetic, Hydraulic and pneumatic friction — Positive and power — Brakes: drum, Pad and band — Belt drives: Flat, V and Ribbed — Variable speed drives — Gearing and gear drives: straight spur, Helica, Bevel and worm drives — Bearings — Sliding bearings: Theory of lubrication, Hydrostatic and hydrodynamic actions and antifriction bearings — Principles of computer-aided design: Design process, Optimum design, CAD applications and Software design packages.

MDP 203 CH METAL CASTING AND EQUIPMENT

Introduction — Solidification processing — Liquid metals — Fluid dynamics — Principles of solidification — Primary (wrought) and casting metals and alloys — Production of primary metals — Production of shaped castings — Patterns — Molding techniques and mold dynamics — Melting procedures and equipment — Design considerations — Structure defects and properties of finished castings — Computer applications in metal casting — Quality control in castings.

MDP 204 CH ELASTICITY AND PLASTICITY

Properties of plane area — Combined stresses — Theories of failure — Slopes and deflections — strains and deformations — Plane analysis and calculation of internal forces for statically indeterminate beams — Frames and trusses — Flexural analysis of curved beams — Shell structure (pressure vessel and liquid container) — Buckling of compression members and planes.

MDP 205 CH INDUSTRIAL STATISTICS

Probability — Discrete probability distributions — Continuous probability distributions — Functions of random variables — Estimation theory — Tests of Hypotheses — Linear Regression and correlation — Multiple linear regression — Analysis of variance.

MDP 206 CH JOINING OF METALS

Classification of welding operations for ferrous materials thermal welding — OXY — ACET. welding — Arc welding — Resistance welding — Submerged arc welding — Spot and seam — welding — Plasma welding — Cold pressure welding — Adhesive welding — Testing of welded joints.

MDP 207 CH MECHANICAL MEASURING EQUIPMENT

Standards for engineering measurement — Temperature measurement — Pressure measurement — Force measurement — Stress and strain measurement — Flow measurement.

MDP 208 CH FURNACES AND HEAT TREATMENT

Classification of furnaces — Furnaces materials — Heat transfer and furnaces design — Fuel-fired flame furnaces — Electric furnaces — Elements of heat treating process — Heat treatment of steel — Heat treatment of cast iron — Heat treatment of non-ferrous alloys (Aluminum — Magnesium — And copper).

MDP 221 CH THEORY OF MACHINES (1)

Mechanisms — Velocity and acceleration diagrams — Static and dynamic forces analysis — Cams — Wheel gearing — Gear train — Governors — Balancing of reciprocating and rotating masses and applications of in-line and v twin engines.

MDP 222 CH PRODUCTION ENGINEERING

Casting processes and defects — Joining of ferrous metals gear cutting — Automatic lathes — grinding operations — Finishing operations — Forming operations (Forging — Extrusion — Rolling).

MDP 223 CH PRODUCTION ENGINEERING

Casting processes and defects — Joining of ferrous and nonferrous materials — Gear cutting finishing operation — Forming operations (Forging — Extrusion — Drawing — Rolling)

MDP 230 CH THERMAL AND MECHANICAL STRESSES

Mechanical stresses: Introduction on stresses and strains in mechanical design, Effect of speed, Effect of shock loading, Effect of impact, Effect of dynamic loading and Fatigue — Thermal stresses: Introduction on the effect of temperature changes, Changes of material

properties with temperature (With constant and variable rates), Thermal stresses due to external constraint, Thermal stresses due to internal constraint — Thermal stresses in: Bars, Plates, Cylinders and spheres — Shrinkage — Shape correction — Creep — Examples on fastening bolts, Pipes, boilers, Pistons and Cylinders — Design of mechanical parts based on thermal stresses — Codes of practice.

MDP 232 CH MACHINE CONSTRUCTION (1)

Basic considerations of machine design-safety factor-stresses — Calculations in design — Screwed — Welded and riveted joints — Shafts and axles — Power screw — Keys — Couplings — Clutches — Springs — Bolts and chains.

MDP 233 CF MACHINE CONSTRUCTION

Basic considerations of machine design-safety factor-stresses — Calculations in design — Screwed — Welded and riveted joints — Shafts and axles — Power screw — Keys — Couplings — Clutches — Springs — Bolts and chains.

MDP 234 CH APPLIED MECHANICS

Mechanisms: Definitions, Inversions of reciprocating engine, Inversions of double slider mechanism, Motor vehicle steering mechanism, Hook's joint, Velocity and acceleration — Equilibrium of machines and force analysis: Static, power-analysis, Friction, Inertia-effect, Center of percussion, Flywheel and turning moment diagram — Cams: types of cams, types of followers, motions of follower, Cam profile and Motion of follower — Gears: Types of gears, Gear geometry and Gear train — Balancing: introduction, Balancing of rotating masses, Balancing of the reciprocating engine and Engine out of balance — Gyroscope.

MDP 301 CF APPLIED MECHANICS (2)

Introduction to mechanical vibration — Single degree of freedom systems: Free vibration, Viscous and coulomb damping, Forced damping vibration, and vibration isolation — Two degrees of freedom — Free — Forced-vibration and dynamic absorber — Dynamic stresses — Equivalent systems: Mathematical models, Geared systems, Crank shafts — Multi degrees of freedom systems: Free torsional vibration, Forced torsional vibration. Critical speed of shafts: shafts uniformly loaded and Shaft with several concentrated loads — Dynamic stresses — Theory of vibration measuring instrument— Vibration and fault diagnoses in machines.

MDP 302 CF MACHINE DESIGN

Part I: Transmission machine parts — Clutches: Positive, Friction and power — Geometry of surface: plane, Conical and cylindrical — Force generation: Mechanical, Electromagnetic, hydraulic and pneumatic — Brakes; radial: block-internal and external-single and double — Band. Axial pad — Belt drives: flat V ribbed Variable speed drives: stepped and stepless-disk, cone and spherical drives-speed control — Bearings: Rolling: dynamic and static capacities, selection of bearings, Grease and oil lubrication, Rubbing and non-rubbing seals. Sliding: Hydrodynamic theory of lubrication, Design factors, Thermal equilibrium, and hydrostatic lubrication — Gears: Straight spur, Helical, Bevel and worm drives-gear units — Part II: Introduction to computer-aided-design and Design applications.

MDP 303 CH METEOROLOGICAL MEASURING EQUIPMENT

International standards in dimensional measurements — Types of measuring equipment — Kinematics design of measuring equipment — Magnification used in measuring equipment — Types of sensing elements — Calibration — Static tests for measuring equipment — Plain limit gauges.

MDP 304 CH MACHINE TOOLS (1)

Performance criteria basic data for machine tool design — Rigidity of the MFTW system and the accuracy of production on machine tools — Determination of principal specifications of the machine tool beings — Frame parts of machine tools — Joints of machine tools — machine tool testing and research.

MDP 305 CH MACHINING TECHNOLOGY (2)

Machining allowances — Machining on capstan and turret lathes — Gear cutting — Cylindrical grinding — Centerless — Surface and internal grinding — Reaming — Circular sawing and broaching — High finishing operation — Advanced machining processes: introduction, Mechanical processes, Electrical processes, Thermal processes, and chemical processes.

MDP 306 CH THEORY OF METAL CUTTING

Concepts of metal cutting — Tool geometry — Effect of tool offset and the ratio of U /V on tool geometry — Chip formation — Built up edge — Mechanics of metal cutting — Cutting forces — Power consumption — Heat in metal cutting — Cutting temperatures — Cutting fluid — Cutting tool material — Tool life and failure.

MDP 307 CH THEORY OF METAL FORMING

Introduction — Mechanical fundamentals — Metallurgical fundamentals — Stress tensor — Criteria for yielding — Tresca 7 VON — Mises criteria — Spring — Back in bending — application of metal forming theory in: Forging, Rolling, Extraction, Wire drawing, Tube drawing and Deep drawing.

MDP 308 CH FORMING MACHINES

Partl; Hammers: Basic types and capacities, Design of main elements — Part 2;: mechanical presses: Types of presses and frames, Press driving mechanisms, Types of clutches and brakes, Safety equipment and precautions against overload and Equipment for automatic presswork — Part3: Hydraulic presses, Press frames, Water and oil as pressure media, Pressure piping, Seals and packing, Pumps for hydraulic presses— Cylinders rams and pistons, Hydraulic accumulators, Valves and Hydraulic circuits — Part4: Rolling Mills, Machines, mills and aggregates for manufacturing primary products, Sheet mills and hot rolling aggregates, Section mills and hot rolling aggregates, Mills for manufacturing economical shapes and machine building components.

MDP 309 CH WORK STUDY

Productivity: Factors affecting productivity and Role of management — Introduction to work-study: Objectives, Techniques and Benefits — Method study technique: Steps controlling the technique, Charts and diagram, Examining and analyzing, Developing new methods, Measure and controls — Work measurements: Direct and indirect methods, Relaxation allowances, And calculation of standard time, Learning curves: concept, Application in work-study and determination of standard time — Incentive schemes: design element, Study of some known schemes and Human factors.

MDP 310 CH AUTOMATIC CONTROL

Introduction to automatic control: Definition and terminology, Block diagram, Algebra, analysis of first and second order control systems and Stability of Control systems — Modeling of dynamic systems: Transfer function and transfer operators, Mechanical and fluid and electrical systems, State variable models and Plant response: System time response, Laplace transform, Open and closed loop transfer function frequency response and Experimental determination of the frequency characteristics of the plant — Industrial process

control systems: Sensors and transducers, Type of controllers and Industrial automation and robotics — Review of digital control: signal processing, Hardware automation mechanical system, Software automation of mechanical system, Using digital, Computer as controller, Discrete state automation, Review of manufacturing systems conventional manual system and Computer assisted manufacturing system, Basic of cam and FMC — FMC components: Robot, Conveyor, Machine and AI effect on FMC performance.

MDP 311 CH FORMING TECHNOLOGY (2)

Forging: Parting line, Forging plane and flash, Types of drafts, Flash types, Estimated billet and its section diagram and Types of configurations — Rolling: Types of passes, Procedure in roll pass design and roll manufacture pass guide — Extrusion: combined extrusion, Design consideration and Suitable and unsuitable shapes for extrusion — Wire drawing: Slip and slip wire drawing and Multiple wire drawing — Tube drawing: Stages of forming and welding seamless tubes — Powder metallurgy: Powder types and production process, Consideration, Applications, High speed forming, Explosive forming, Elector hydraulic forming, Electromagnetic forming, Superplastic, Rubber, Pad forming, Pneumatic, Mechanical high speed forging dynopak, U.S. Industries and petro — Forge, Water hammer forming and fuel combustion forming.

MDP 312 CF VIBRATIONS AND AUTOMATIC CONTROL

Mechanical vibrations: Definition, Measurement methods, Periodic vibration, Harmonic vibration, Characteristics of complex vibration, Types of machine vibrations, Frequency spectrum — Linear system analysis: Modeling of Linear systems, Response of linear systems and Effect of feedback — Stability of linear systems: Stability methods and Relative stability Introduction to non-linear systems: Nonlinear systems analysis, Nonlinear components, Effect of nonlinear components on the system stability and Stability region.

MDP 322 CH THEORY OF MACHINES (2)

Introduction to mechanical vibration — Single degree of freedom systems: Free vibration, Viscous and coulomb damping, Forced damping vibration and vibration isolation — Two degrees of freedom: free, Forced-vibration and dynamic absorber and Dynamic stresses — Equivalent systems: Mathematical models, Geared systems, Crank shafts and Multi degrees of freedom systems: free torsional vibration, Forced torsional vibration — Critical speed of shafts: Shafts uniformly loaded, Shaft with several concentrated loads, Dynamic stresses, Theory of vibration measuring instrument, Vibration and fault diagnoses in machines.

MDP 333 CH MACHINE CONSTRUCTION (2)

Introduction on main design considerations — Design of transmission shaft — Belts and wire ropes — Design of sliding bearings — Rolling bearings and pressurized bearings — Lubrication — Seals and packing — Design of gears — Design of springs — Design of cylinders.

MDP 401 CF PROJECT

The general aim of the project is to allow each student to integrate all the disciplines he has studied in a unified piece of knowledge. On the behavioral side — Students are allowed to work in a team so as to practice working in a collaborative environment. Since any engineering endeavor should result in a well planned — Executed — And maintained system — An important aspect of the project is to let the students be trained in following a scientifically based engineering methodology for the project implementation. This emphasizes also a proper documentation and presentation procedure. On the technical side — Students are allowed to choose among a number of projects suggested by the different staff members. The

topics of these projects usually reflect the unified educational policy of the department and is usually related to different subjects in the curriculum

MDP 402 EH INDUSTRIAL ORGANIZATION

Plant organization — Planning industrial projects — Work study – Plant layout — Industrial cost accountings — Production planning and quality control –- Industrial relations — Introduction to operation research.

MDP 403 CH PLANT LAYOUT

Production systems and types of layout — Types of data formats: The flow matrix, The closeness rating and The distance matrix -- Calculation of machinery and space requirements: Number of machines calculation, Multiple activity charts, Methods of space determination and Activity and space relationship diagrams — Quantitative techniques: Spiral method and Sequence demand and analysis — Mathematical layout formulation: the objective function and Methods of solutions — Materials handling equipment: Trucks, Conveyors, Cranes and Storage equipment — Industrial safety: Hazards and industry, Precautions and regulations — Equipment.

MDP 404 CH TOOLS DESIGN AND PRODUCTION EQUIPMENT

Part1: Design of dies, Types of press forming machines Design of shearing dies: Single, Compound, Progressive and Combination Dies — Design of bending dies — Applications on shearing and bending dies — Introduction to deep drawing — Deep drawing die calculations — Deep drawing process control: press speed, Lubrication Strain, Hardening in deep drawing — Selection of materials for deep drawing tools, Die manufacture and Heat treatment and failure of dies — Molds for injecting plastics: Elementary mold design, Intermediate mold desig, Part2: Machining: Design of special tools — Manual design — Computer Aided Design — Basics of machining fixtures.

MDP 405 EH QUALITY CONTROL

Part I; Fundamentals: Introduction, Choosing a sampling plan — Part II: Acceptance sampling by attributes: Single plans for attributes — Double — Multiple —sequential sampling — Part III: Acceptance sampling by variables: Acceptance sampling by variables to control the fraction defective — Acceptance sampling by variables to control the defective — Acceptance sampling by variables to give assurance regarding the mean or standard deviation of a process or lot — Part IV; Control Charts: The general theory of control charts — Control charts for attributes — Control charts for variables — Cumulative sum control charts.

MDP 406 CH MACHINE TOOLS (2)

Types of machine tools from automation point of view — Introduction to the CNC machines — input components (Data carriers, Data readers, Memories) — Interpolators (Digital and analog interpolators) — Derives — Sensors and error detectors — CNC manual programming.

MDP 407 CH METROLOGY

Linear measurement — Angular measurement — Form measurement — Thread — Gears — Flatness — Straightness — Alignment and roundness — Surface texture — Laser measurement — Interpherometry — Application of the acceptance test on M/C tools.

MDP 408 CH OPERATIONS MANAGEMENT

Forecasting and time series analysis — Aggregate production planning — Inventory management and control — Capacity management and measurement — Materials requirement planning — Maintenance management and control — Work scheduling — Marketing of engineering products.

MDP 409 CH OPERATIONS RESEARCH

Linear programming: Graphical method, Simplex method and Dual sensitivity analysis of simplex method — Transportation problem: Northwest corner rule, VAM, Stepping stone method, U-V method and Assignment problem. PERT/CPM: Critical path calculations, Crashing and Resource Leveling, Shortest Route Problem, Djkastr's algorithm — branch and Bound Technique: Application to the integer programming — Queuing theory: M\M\1 system single server — M\M\S system Multiple servers, M\M\1\a system, Queue capacity limitation and Simulation Monte Carlo.

MDP 410 EH QUALITY SYSTEMS

Basic concepts — Definitions — Terminology — History of Quality control — Quality control engineering — Quality system for Design and Development — Production and construction for quality control systems — Quality control of purchases — Quality control during product Use — Employee Participation Programs and just-in-time.

MDP 411 CH INDUSTRIAL LEGISLATION AND ECONOMICS

Part1: Industrial Legislation: Industrial Property, Industrial safety and Labor legislation law — Part 2: Engineering Economy: direct and Indirect costs, Allocation of (burden Rates), Fixed and Variable costs, BEA comparisons, Depreciation, Straight-line method — Declining-balance method, Sum-of the-years digit method — Discounted cash- flow: Time-Value equivalents for single payments and multiple payments, Present Worth comparison, Equivalent annual worth comparisons, Rate of return Comparisons, Replacement analysis. Analysis of public projects — B\C analysis, Payback comparisons — Decision under risk — Decision trees — Feasibility studies.

MDP 411 EH INDUSTRIAL PROJECT MANAGEMENT

Introduction: The nature and planning of industrial projects — Human element in project: team work, Leadership and Scheduling — Financial aspects: feasibility study, Financing investment, Cost of control, Organization aspects and Project planning aspects.

MDP 412 EH TOTAL QUALITY CONTROL

New design control: Defining, Scope, Application and organization a new-design control Incoming-material control: Defining, Organizing and technique of incoming material control. Production control: the needs and definitions, Role of process control, Product control Activities, Technique, Process-capability studies, Quality audits and Special process studies: elements — Organizing and examples of special process studies.

MDP 413 EH PROCESS QUALITY CONTROL

Quality — Process and control: definitions — Data collection: Classification and analysis of date — Flow chart: Type and Examination — Check sheets: Function and quality control, Histogram, graphs, Brawstorming, Pareto analysis, Cause and effect diagram, Scatter diagram, Control charts and Process capability.

MDP 420 EH ENGINEERING MARKETING

The department based on the up-to-date topics in this field will determine the contents.

MDP 421 EH TOPICS IN DESIGN AND PRODUCTION ENGINEERING

The department based on the up-to-date topics in the design and production engineering will determine the contents of any of the subjects.

MDP 422 EH COMPUTER APPLICATIONS IN INDUSTRY

The contents of any of the subjects is to be determined by the department based on the up-to-date topics in computer applications in industry.

MDP 431 CH INDUSTRIAL ORGANIZATION

Plant organization: Planning industrial projects, Work study, Plant layout, Industrial cost accountings, Production planning and control and Industrial relations — Introduction to operations research.

MDP 432 CH INDUSTRIAL ORGANIZATION

Productivity — Introduction to work study — Method study technique — Charts and diagram — Examining and analyzing — Developing new methods — Work measurements — Learning curves — Incentive schemes — Human factors — Production systems and types of layout — types of data formats — Calculation of machinery and space requirements — Activity and space relationship diagrams — Quantitative techniques — Mathematical layout formulation — Materials handling equipment — Industrial safety — Plant organization — Planning industrial projects — Work study — Plant layout — Industrial cost accountings — Production planning and quality control — Industrial relations — Introduction to operation research.

11- COURSES OFFERED BY THE DEPARTMENT OF MECHANICAL POWER ENGINEERING

MEP 120 CH THERMODYNAMICS

Basic concepts and definitions — System and control volume — Property and state — Processes and cycles — Work and Heat transfer — Work definition — Work at a moving boundary — Other forms of work — Definition of heat transfer — Comparison between work and heat — Ideal gases — State equation and the relation between pressure, Temperature and specific volume — Specific heat at constant pressure and volume — Tables of thermodynamics — Pure substances — Phase equilibrium — Temperature - Specific volume diagram — Properties of pure substances — Conditions to determine the state — Tables of thermodynamic properties — First law of thermodynamics — First law for closed and open systems — Application of first law on processes — Internal energy — Enthalpy — Conservation of mass — Steady state, Steady flow process — Uniform state-uniform flow processes — Gas mixtures — Atmospheric air — Combustion products — Reciprocating compressors — Compressor cycle on a P-V — Diagram calculation of compressor work — Multi - Stage compressors — Intercooling.

MEP 121 CH THERMODYNAMICS

The working fluid — Ideal gas — First law of thermodynamics — Reversible processes — Irreversible processes — Second law of thermodynamics — Thermal cycles — Vapor cycles — Entropy — Kinetic theory of gases — Gaseous mixtures — Fuels and combustion — Heat transfer by conduction — Forced convection — Heat transfer by radiation — Heat exchangers — Steam power stations — Refrigeration and air conditioning — Modelling of thermal systems.

MEP 220 CF THERMODYNAMICS (2)

Second law of thermodynamics — Qualitative difference between work and heat — Cyclic heat engines— Heat reservoirs— Kelvin-Planck and Clausius statements— Refrigerator and heat pump— Reversibility and irreversibility— Causes of irreversibility— Conditions of reversibility — Carnot cycle and its efficiency — Reversed heat engine — Entropy: (Reversible paths, Clausius theorem, Entropy, temperature - diagram — The inequality of Clausius — Entropy increase and its causes —Entropy and direction —Exrgy: (Eergy in closed and open systems, Exergy loss and its representation on diagrams) — Thermodynamic cycles: (Analysis Representation on T-S and P-V diagrams) — Derivation of the cycle efficiency and applications for the following cycles: (Rankine cycle, Regeneration and Reheat, Vapor compression cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, stirling and Ericson cycle and Air standard refrigeration cycle — Second Low Analysis: (Thermodynamic Relations, Maxwell relations, Clayperon relation as application of one of the Maxwell relations in the two phase region) Models for real gases: (Compressibility Factor, Van der waals equation, Generalized chart for Enthalpy changes at constant Temperature, Generalized fugacity chart generalized chart for changes of entropy at constant temperature.

MEP 221 CF HEAT AND MASS TRANSFER

Introduction: Modes of heat transfer: (Conduction, Convection and radiation) Energy balance on a surface — Heat transfer by conduction — Generalized heat conduction equation — One dimensional heat conduction without internal heat generation — Thermal insulation — Heat conduction with internal heat generation — Plain walls and cylinders — Heat transfer from fins — Heat transfer by convection — Thermal and hydrodynamic boundary layers — Dimensional analysis — Free convection — Forced convection — Boiling — Condensation — Thermal radiation — Radiation laws — Thermal radiation heat transfer between black and gray Bodies — Radiation from gases and vapors — Heat exchangers — Types — Performance of heat exchanger — Mass transfer: (Mass transfer by diffusion in a stationary binary mixture, Fundamental Equations for diffusion, Equal molecular diffusion between the two components, Diffusion for one component only and Mass transfer by stationary diffusion between liquids and gases for laminar and turbulent flow).

MEP 222 CF FLUID DYNAMICS

Basic equations of fluid mechanics: Kinematics of flow-control volume approach — Continuity, Momentum and energy equations —compressible flow and sonic speed-flow through nozzles — Dimensional analysis and dynamic similitude: (dimensional homogeneity, analysis and similitude, correlation of experimental data) — Flow in closed conduits: (laminar and turbulent flows, hydraulic and energy gradient line) — Parallel and series pipes — Flow over immersed bodies : (Boundary layer-drag and lift forces) — Inviscid flow: (Stream function and velocity potential, airfoil — Navier Stokes equation of motion —applications to viscous flow — Graphical solution methods of unsteady laminar flow.

MEP 223 CH HEAT ENGINES

Power plants — Thermal cycles — Analysis and presentation on property diagrams — Steam Units — Boilers — Steam turbine — Condensers — Open and closed type heaters — Pumps — Gas turbines and combined cycles components and performance of gas turbines — Combustion chambers and burners — Air compressors — Diesel units — Components and performance — Speed governors — Injectors and injection pumps — Hydraulic units — Hydraulic turbines — Components and performance — Pumping units and storage tanks pumps — Pipeline networks — Control valves — Storage tanks.

MEP 224 CH HEAT TRANSFER

Heat transfer by conduction— General equation— Steady state one dimension heat transfer through plane and cylindrical surfaces— Heat transfer with internal heat generation. Critical insulation radius for cylindrical surfaces— Heat transfer through extended surfaces (Fins) — Heat transfer by convection— Free convection heat transfer— Forced convection heat transfer— Radiation heat transfer— Radiation surface properties— Radiation from black and gray bodies— Radiation heat exchange between two black or gray surfaces — Heat Exchangers: (Types, Logarithmic temperature difference, and Use of heat exchangers charts).

MEP 225 CH THERMODYNAMICS (2)

Second law of thermodynamics: Reversibility and Irreversibility — Sources of irreversibility — Kelvin-Planck statement — Clausius statement — Heat engines — Carnot cycle — Refrigerator and heat pump — Entropy: (Clausius inequality, Entropy as a thermodynamic property, Principle of entropy increase, Causes of entropy increase) Exergy: (Concept of lost work, Exergy for closed systems, Exergy for open systems. Cycles: (Analysis and representation on P-V and T-S diagrams, Cycle efficiency calculations) Second law analysis for: (Rankine, vapor-Compression, Otto, Diesel, Dual, Brayton, Stirling, Ericson and air standard refrigeration cycle).

MEP 226 CH FLUID DYNAMICS

Basic equations of fluid mechanics: Kinematics of flow — control volume approach — continuity, Momentum and energy equations — compressible flow and sonic speed — flow through nozzles — Dimensional analysis and dynamic similitude: (Dimensional homogeneity, analysis and similitude-correlation of experimental data) Flow in closed conduits: (Laminar and turbulent flows-Hydraulic and energy gradient line-Parallel and series pipes) — Flow over immersed bodies : (Boundary layer-drag and lift forces). Inviscid flow: (Stream function and velocity potential-airfoil - Navier stokes equation of motion-applications to viscous flow) — Graphical solution methods of unsteady laminar flow.

MEP 227 CH THERMAL ENGINEERING

Second law of thermodynamics: (Reversibility and irreversibility - Source of irreversibility - Two statements of the second law) — Heat engines — Carnot cycle — Refrigerator and heat pumps — Entropy: (Clausius inequality - Concept and causes of entropy increase) — Exergy: (Concept of lost work, Exergy of open and closed system) — Cycles: (Analysis and representation on P-V and T-S diagrams, Efficiency calculations and second law analysis of Rankine cycle, Vapor compression, Otto, Diesel, Dual, Brayton, Stirling and Ericsson cycles) Conduction heat transfer: (General equation, One dimensional heat transfer through flat surface and cylinders with heat generation, Critical radius for isolation, Heat transfer through fins) — Convection heat transfer: (free convection, Forced convection) Radiation heat transfer: (surface properties, Radiation between black body and gray body, Radiation between two gray bodies) — Heat exchanger: (Types, Logarithmic temperature difference, And use of heat exchangers charts).

MEP 231 CH FLUID MACHINERY

Fundamental Concepts and Fluid dynamics— Kinematics of Flow — Control volume approach — Continuity equation — Momentum equation — Energy equation — Flow in closed Conduits: (Dimensional analysis, Laminar and turbulent Flows Hydraulic and total energy lines — Parallel and series pipes) Fluid machines: (Types and classifications, Fluid

motion, Construction, Performance, Pumps, Compressors and turbines) — Hydraulic and pneumatic systems: (Pneumatic screwer and grippers, Hydraulic hoists and presses).

MEP 320 CH MEASUREMENTS

Performance characteristics of measuring instruments — Calibration — Fixed and random errors — Error estimation — Sensitivity — Linearity — Dynamic characteristics — Experiments: (Calibration of manometers, Pressure measurements, —Transient response of pressure measurement instruments, — Mechanical pressure transducers, Manometers, Elastic pressure measurement, Electrical pressure transducers, Inductive transducers, Piezo electric transducers, Straingauge transducers and Experiments with the pressure measurement bench) — Flow measurement — Orifices — Nozzles — Venturi — Turbine flow meter — Magnetic flow meters — rotameter — Positive displacement flow meters — Ultrasonic meters — Experiments on flow measurements bench — Velocity measurements — Pitot tube — Laser Doppler anemometers — hot wire anemometer — Experiments with pitot tubes — Temperature measurements — Thermal expansion thermometers — Resistance thermometers — Semi conductor thermometers — The thermocouples — Thermal radiation thermometers — Experiments with temperature measurement bench — Analysis of combustion products — Probes — Sample conditioning — Gas analysis equipment for measuring O_2, CO, CO_2, UHC, NO_X, and SO_X Gas chromatography — Experiments on the steam boiler.

MEP 321 CF COMBUSTION

Fundamentals: Definitions — Atomic and molecular structure — Heat of formation and bond energy — Adiabatic flame temperature — Chemical reactions — Flame propagation — Chemical equilibrium — Detonation and deflagration — Applications: (Boilers, Types, Construction, Firing, Grates Burners, Heat transfer, Draft, System engineering) — Gasifirs — Types, Internal combustion engines — Special combustion cases: (Flame quenching and Cyclic combustion and variations) — Gas turbines: (Cycles, Matching of compressor and turbine, Combustion analysis) — Jet propulsion: Flow through nozzles, Rockets types — Propellants and Steady state analysis) Measurements techniques: (Temperature, Optical methods, Gas analysis, Chromatography and Spectroscopy).

MEP 322 CH AUTOMATIC CONTROL

Introduction: Definitions — Control terminology — Classification of control systems — Mathematical derivation of systems governing equations: (Mechanical, Electrical, Hydraulic, Pneumatic, thermal) Laplace transform and its inverse — Application to solution of ordinary differential equations — Transfer function — Partial fraction expansions — System time response: first and second order systems subjected to step, impulse or periodic input functions) — System classification and coefficients — Control actions and industrial controllers: On-Off and PID controllers — Pneumatic, Hydraulic and electronic controllers) — Frequency response: (Bode plots, Polar plot, M and N circles) Nyquist stability criteria: stability analysis — Nicholas chart analysis and design and Closed loop frequency response) — System compensation: (lead, Lag and lead-lag).

MEP 323 CH FLUID MACHINERY

Introduction and classification of turbo-machines — Thermodynamics and fluid mechanics of flow through turbo-machines: (Pumping machinery and Turbo blowers) — Performance of centrifugal compressors — Performance of radial flow gas turbines — Operation and maintenance of radial flow turbo-machines — Hydro-dynamic power transmission: (Fluid couplings andTorque converter).

MEP 324 CH AIR CONDITIONING IN BUILDINGS

Thermal comfort cooling and heating loads — Industrial control of thermal environment — Industrial ventilation in buildings — Refrigeration cycles and components — Basics of control systems — Air conditioning (central/non central) — System selection and economics — Suitability of conditioning systems to architecture conditions — Distribution of exits and air ducts — Technical standards — Integration of air conditioning system and other building systems.

MEP 325 CH REFRIGERATION AND AIR CONDITIONING

Psychrometry and wetted surfaces heat transfer: (Phychrometry, Psychrometric chart, Phychrometric processes and wetted surfaces heat transfer, Phychrometric chart condition line for a space) — Thermal comfort — Cooling and heating load calculations: (Weather data, Thermal insulation and water vapor retarder, Building materials and water vapor transmission data, Residential air conditioning cooling and heating loads calculations, and Non residential air conditioning cooling and heating loads calculations) — Comfort air conditioning: (residences and Commercial and public buildings) Air conditioning and heating systems: (System selection and design, Single zone systems, Multiple zone systems, Reheat systems, and Dual duct or multi zone systems, Variable air volume systems, Water systems unitary systems, Packaged systems) — Air handling equipment: (Design of ducts, Construction of ducts, Air diffusing equipment, Fans and system balancing) Evaporative cooling and dehumidifiers — Air cleaners — Ventilation of industrial environments — Industrial exhaust.

MEP 330 CH THERMAL PLANTS

Thermodynamics and heat transfer review — Rankine cycle and its improvements — Effects of advances in terminal steam conditions — Optimization of feed-heating in regenerative cycle: (Optimum enthalpy rise division among feed - Water heaters, Optimum numbers of feed-water heaters) — Choice of reheat pressure in reheat cycle — Cogeneration — Steam Generators — Fire tube boilers — Water - tube boilers — Steam drum — Economizer — Superheaters and reheaters — Superheat temperature control — Air preheaters — Energy balance of steam generators — Surface condensers — Air ejectors — Closed feed -Water heaters — Open feed - water heaters and deaerators — Evaporators —Circulating water system — Cooling towers — Cooling lakes and ponds — Spray ponds and canals — Steam piping — Steam traps.

MEP 331 CF INTERNOL COMBUSTION ENGINES

Definitions — Classification of I.C.E. The fuel -air standard cycle — Deviations between the actual cycle and the fuel air standard cycle — Combustion in S.I.E. combustion chambers — Combustion in C.I.E — Combustion chambers — Fuel properties and its impact on engine performance and Friction and lubrication — Effect of engine operating conditions on friction loss — Engine performance at constant speed. Cooling loss — Effect of engine operating conditions on cooling loss — The engine actual cycle — Engine air capacity — The two stroke engine — Scavenging processes — The scavenging coefficients — Engine power of the four stroke engine — Engine volumetric efficiency — Engine performance at constant and variable speeds.

MEP 332 CF FLUID MACHINERY

Turbo machinery: (Gas dynamics, Sound velocity and Mach number, Flow through convergent nozzle, Flow through convergent divergent nozzle, Flow through diffuser and Shock wave) Centrifugal pumps: (Theory and operation, Performance, Parallel and series operation. Cavitation and Axial thrust) — Water hammer — Water hammer in pipelines —

Positive pumps: (Reciprocating pumps and Rotary positive pumps) — Water turbines: (Impulse turbines, Radial flow turbines and Axial flow turbines).

MEP 341 EH MECHATRONICS

Introduction to electronic circuits — Amplifiers — Counters — Voltage regulators — Timer— Transistors — Logic gates — Lead displays — Digital/Analogue and Analogue/Digital conversion — Data acquisition systems — Application of control circuits to perform the following: (Speed measurements, Displacement, Level and velocity measurements, Temperature and pressure monitoring, Control of opening and closing value, Use of stepper motors, Electronic ignition and injection in engines, and Other applications) — Introduction to robotics.

MEP 342 EH THERMAL PROCESSES

Drying processes — Cement kilns — Glass furnaces — Fertilizers — Condensation processes — Cryogenics — Oil refineries — Oil extraction and hydrogenation.

MEP 343 EH NEW AND RENEWABLE ENERGY

Introduction to wind energy — Wind speed and direction measuring devices — Analysis of wind energy data (Frequency curves and Power duration curves). Basic theory for an ideal wind turbine — Bety theory — Airfoil theory and analysis of airfoil blade forces — Performance of horizontal axis wind turbines — Performance of vertical axis wind turbines — Wind turbines for electricity generation — Wind turbines for pumping underground water — Control systems used for wind turbines during storms — Introduction to solar energy — Data concerning the sun and its thermal radiation — Solar angles — Solar collection theories —Thermal storage — Economic feasibility study for solar energy applications.

MEP 344 EH REFRIGERATION AND AIR CONDITIONING

Thermal cycles — Properties of atmospheric air — Refrigeration systems — Ventilation and air conditioning systems — Properties of refrigerants — Refrigeration compressors — Evaporators and condensers — Expansion valves — Matching components in vapor compression systems — Thermal insulation — Solar heat gain in automobiles — Human comfort — Truck cold stores.

MEP 430 CF ENERGY PLANT

Introduction: (Conventional and renewable energies, Energy conversion systems, Central stations, Generation and Transmission and distribution of Electric energy) — Variable load: (load curves and factors, Spinning and cold reserve, Effect of variable load on design and performance of power plants) Base and variable load units — Energy storage — Regulation of central station units — Steam turbine governors — Speeder gears — Speed-load characteristics — Units in parallel — Station performance —Input-output characteristics — Integrated heat rate — Optimum load division between units — Testing and operation — Reliability tests — Acceptance tests — Guarantee figures — Starting and stopping of units — Synchronization — Lubrication — Emergency governors — Protection — Automatic tripping — Nuclear power plants: (Principles, Types of reactors, Calculations and Safety) — Costing of energy — Fixed and variable costs — Selection of units — Power plants and the environment.

MEP 431 CH COMBUSTION ENGINES

Engine fuel feeding systems: (Spark Ignition Engines, The carburetor, Engine mixture requirements for best performance, The simple carburetor and Methods of automatic mixture

control to fulfill mixture requirements for best control) — Fuel injection: (Types of systems and components) — Compression ignition engines: (Injection systems, types and components, Performance and tests) — Supercharging: (Methods, Matching of engine and supercharger) — Ignition: (System types and components, Conventional and electronic) — Governors: (Types, components, and Performance map).

MEP 432 CF FLUID MACHINERY

Classification, Construction and performance of centrifugal fans — Classification, construction and performance of centrifugal blowers — Classification, Construction and performance of centrifugal compressors — Performance of airfoils — Constructions and performance of axial pumps — Hydraulic transmission — Renewable energy applications: (wind, Wave, Tidal and Hydraulic ram) — Pumped storage — Classification, Construction and performance of steam turbines — Classification, construction and performance of gas turbines.

MEP 433 CF REFRIGERATION AND AIR CONDITIONING

Psychrometry and wetted surfaces heat transfer: (Phychrometry, Psychrometric chart, Phychrometric processes and wetted surfaces heat transfer, Phychrometric chart condition line for a space — Thermal comfort — Cooling and heating load calculations: (Weather data — Thermal insulation and water vapor retarder, Building materials and water vapor transmission data, Residential air conditioning cooling and heating loads calculations, and Non residential air conditioning cooling and heating loads calculations) — Comfort air conditioning: (Residences and Commercial and public buildings) Air conditioning and heating systems: (System selection and design, Single zone systems, Multiple zone systems, Reheat systems, and Dual duct or multi zone systems, Variable air volume systems, Water systems unitary systems, Packaged systems) — Air handling equipment: (Design of ducts, Construction of ducts, Air diffusing equipment, Fans and system balancing) — Evaporative cooling and dehumidifiers — Air cleaners — Ventilation of industrial environments — Industrial exhaust.

MEP 436 CF PROJECT

The student should study and perform one of the projects specified by the department and in that he would make use of the basic and applied subjects that he acquired throughout his study. The student would also be supplied with the necessary data and information related to the given project through lectures given on the course of the project implementation. These data should concentrate on the applied engineering aspects. At the end of the project the student shauld write a report according to the known technical specifications for writing a scientific report.

MEP 440 EH CONTROL APPLICATIONS IN THERMAL ENGINEERING

Final control elements and actuators: (Hydraulic, Pneumatic, Electronic and electrical)— Applications of automatic control in the internal combustion engines — Conventional speed control systems: (Mechanical and hydraulic) — Speed control using electronic circuits which measure and control engine operating parameters and loads — Industrial boilers and furnaces — Water level control — Steam flow and burner load control — Thermal power plants — Input/Output control methods of plant components.

MEP 441 EH Control Applications In Fluid Machinery

Final control elements and actutor: (Hydraulic, Pneumatic, Electronic and Electrical contnol systems) Control applications in power turbines — speed control of steam turbines — load control of gas turbines — control of compressors — Operating pressure control — Motor

protection circuits — Pumps — Control valves — Non-return valves and protection circuits.

MEP 442 EH CONTROL APPLICATIONS IN REFRIGERATION AND AIR CONDITIONING

Final control elements and actuators: (Hydraulic, Pneumatic, Electronic, and Electric systems — Refrigeration and freezing systems — Temperature and humidity control of cold stores — Ventilation humidification and air conditioning — Temperature and humidity control of conditioned spaces using hot or cold water and return air.

MEP 443 EH COMPUTER APPLICATIONS

Introduction to computer languages — Fortran — Basic — C language — Computer applications in the following fields: (Engineering drawing, Graphs, Curve plotting in one, Two and three dimensions — Contour plotting — Statistical control — Calculations of mean, Standard deviation and errors — Wave form analysis — Curve fitting using least squares or other methods, Solution of algebraic equations, Linear and non linear equations, Simultaneous equations using iterative, Newton - Raphson, Gauss and matrices methods, Solution of differential equations, Euler and Runge Kitta methods, Partial differential equations, Finite difference methods, Method of characteristics, Computer simulation of thermal processes and fluid flow, Solution of one dimensional fluid flow, Calculation of air and gas flow through induction and exhaust valves — Boiler efficiency calculations — Gas flow through boilers — Heat exchanger performance — Thermal load calculations — Steam and water pipelines networks.

MEP 444 EH CONTROL OF FLUID POWER

Basic fluid power systems — Fluid controlling elements — Valves and simple circuits — Directional valves — Flow control valves — Pressure control valves — Static characteristics of valves — Aspects of circuit design — Pneumatic servomechanisms — Dynamics of pressure and speed control systems.

MEP 445 EH PIPE LINE NETWORKS

Elements of pipe line networks — Gases— Liquids — Vapors and multi-phase fluids — Pumping and control stations — Flow rate measurements of networks — Hydrodynamic analysis of networks under steady and unsteady operation — Design applications of simplified networks — Stress analysis in piping systems networks — Cathodic protection of buried pipes and tanks — Storage in stations.

12- COURSES OFFERED BY THE DEPARTMENT OF AUTOMOTIVE ENGINEERING

MEA 235 CF AUTOMOTIVE TECHNOLOGY

Classification of vehicles: Passenger, Van Trucks with different loading capacities, Trailers and semi-trailers — Main principles of operation and schematic representation of the different types of parts: Prime mover, Automotive engines, Transmission line, braking systems and Suspension — (Front axles, Leaf and coil springs and Shock absorber). Rear axle- Steering mechanisms — Tires — Frame and body — Accessories — Concept and importance of safety — Comfort — Pollution and performance.

MEA 241 CH AUTOMOTIVE ENGINES

Classification of combustion engines — working cycles — Combustion in S.I. engines — Combustion in C.I. engines — Friction and lubrication — Engine cooling — Supercharging

of S.I. and C.I. engines — Testing and performance: performance parameters and Basic measurements (Speed, Fuel consumption, Exhaust smoke, Exhaust emissions, Brake horse power and Performance maps).

MEA 311 CH CAR MEASURING INSTRUMENTS

Measurement systems and their characteristics — Static characteristics — Dynamic characteristics — Time domain analysis — Frequency domain analysis — Errors in measurement and their analysis: Classification of errors, Statistical analysis, Probability errors and Limiting errors — Measuring Instruments: Classification of instruments, Indicating instruments, Balancing — Torque — weight ratio, Recording instruments and Integrating instruments — Instruments for special purpose: Measurement of resistance — Current — Measurement of voltage — Measurement of inductance, Capacitance, Frequency and Magnetic measurements — Measurement of non-electrical quantities: Transducers, Measurement of temperature, Displacement, Speed, Measurement of strain and stress — Pressure.

MEA 321 CH AUTOMOTIVE ENGINEERING (1)

Mechanics of pneumatic tires — Tire forces and moments — Rolling resistance of tires — Relationship between tractive effort (braking effort) and longitudinal slip of tires — Tire radii — Cornering properties — Performance of tires on wet surfaces — Performance characteristics of passenger cars and trucks — Road resistance — Traction and tractive effort — Gear transmission — Road performance curves — Equation of motion and maximum tractive effort — Dynamic performance certificate — Acceleration time and distance — Gradiability — Overtaking — Brakes: (Disc Bvalce, Dvum Brake, Effecien) Steering mechanisms: Condition of perfect steering — Geometry, Ackerman system, Stability on curves and Wheel angles.

MEA 331 CH AUTOMOTIVE DESIGN (1)

Classification of springs: Torsion, Flexural and Tension compression — Coil spring advantages — Stress analysis — Deflection — Spring rate — Spring ends — Solid height — Free height — Buckling of spring — Natural frequency — Fatigue — Concentric springs — Design considerations — Rigid axle beam suspension: Design considerations, Construction and Design of axle beam — Forces on king pin — Forces on bearings — Leaf spring — Independent suspension Main types: Double wishbone, Macpherson, Force analysis, Relation between position and location of different members — Bearings: Sliding, Rolling bearings, Roller bearings, Dynamic capacity, Relation between load and life and Equivalent load — Brakes Types: Drum, Disc, Master glinder, Mechanical advantage and Hydraulic advantage — Assisted brake system — Other types of suspension systems air suspensions Chassis design Types: Perimeter, X shape, Ladder type and Design.

MEA 332 CH AUTOMOTIVE DESIGN (2)

Belts: Flat leather belts, Stresses, Design, Belt pulleys and Load carrying capacity of belts — Diaphragm springs — Shaft — Rivets — Hydraulic coupling — Cardan shaft — Gears: Spur, Helical, Bevel, Worm and materials — Stresses dynamic strength — Gear box — Synchronizer — Design: Shafts, Gears, Bearings, Differential Requirement,Torque distribution, Gear type differentials gearless and worm gear differentials.

MEA 342 CH FUEL MANAGEMENT

Requirements of automotive ICE from the fuel systems — Petrol fuel management: Specific requirement at part loads and higher loads— Metering the air-fuel mixture according to quantity — Formation of the air-fuel mixture — Transporting of the air-fuel mixture — Distributing of the air-fuel mixture — Carburetors principles and systems — Design and

metering principles — Transient systems: Starting, Idling — Modern carburetors: Electric and electronic ones — Petrol injection: Diesel Injection: Specific requirements concerning diesel engines characteristics — Fuel injection process: Mechanical and electronic techniques for generating high injection pressure. Diesel injection systems: Unit injectors system. Governors: Mechanical governors, Electronic actuator— Diesel injection testing.

MEA 361 EH TRANSPORT ECONOMICS

Transport: People and Goods — Types of vehicles — Technical specifications according to its use (City, Tourist,... — Problems of transport inside cities — Factors affecting the criteria of choice between the different methods: Speed, Frequency and Safety — Requirements of an economical method of transport — Economic evaluation of transportation plans — Others — Study of movement between source and target — Elements of economic engineering planning of transport — Costs — Vehicle operating cost: Effect of different factors on operating cost — Determination of an optimum replacement policy — Stores.

MEA 362 EH POLLUTION FROM VEHICLES

Sources of pollution: Exhaust gas, Types of pollutants and Their effect on human health — Methods of measurement: Carbon monoxide — Effect of engine characteristics on the amount of pollutants in petrol and diesel engines — Engine design: Design of combustion chamber — Swirl — Injectors — Design of exhaust muffler — Methods of reducing pollution from exhaust gas: Noise: Sources of noise emitted from vehicles: Side effects of exposure to noise — Noise measurements — Effect of load — Engine speed — Engine size etc — On level of noise — Noise reduction — Vapors: Sources of pollution by vapors: fuel tank — cylinder block.

MEA 363 EH USE OF NATURAL GAS IN CAR ENGINES

Review of engine performance: Effect of compression ratio and excess air factor on engine efficiency and power — Pollutant formation inside the combustion chamber: Pollutants Nitrogen oxides — Carbon monoxide — And hydrocarbons — Smoke and lead oxides — Composition and combustion of natural gas — Difference between natural gas — Liquefied petroleum gas LPG and Bio — Gas tank specifications — Conversion of petrol engines to natural gas engines Bi-fuel system — Dedicated fuel system — Conversion of diesel engines to natural gas engines — Dual fuel system — Dedicated fuel system — Suitability of each type of conversion according to car type and usage — Testing of an engine before and after conversion.

MEA 364 EH PNEUMATIC AND HYDRAULIC SYSTEMS

Hydraulic systems: Fixed displacement — Fixed displacement piston pumps and variable displacement Hydraulic pumps: Pump controls and systems— Motor control — Hydrostatic transmissions: Hydraulic diagram — System efficiency — Installation configurations — Applications and pneumatic systems — Air valves — Service brake valve — Parking brake valve — Automatic load sensing valve — Mufflers — Pressure modulation valve single — Relay action — Shuttle valve. Air pressure regulator safety valves — Air drivers — Air cushion systems and their performance.

MEA 365 EH VEHICLE AERODYNAMICS

Aerodynamic forces and moments: Origin of the aerodynamic force —. Air viscosity phenomena: Air flow separation and car shape — Wake of the car — Air flow around a car — Styling of stream lined back — Aerodynamic lift — Effect of aerodynamic force on performance — Effect of using air deflector on improving vehicle performance — Aerodynamics and styling: Scale model and aerodynamic tests — Ideal shape as a styling criterion — Reducing drag by increasing the wake pressure — Fundamental analysis of

forces affecting car and steady state stability — Effect of aerodynamic forces on transient stabilities.

MEA 412 CH PLANNING OF SERVICE STATIONS

Planning of workshop: Importance and objectives of maintenance — Types of maintenance, Man -hour needed for accomplishing maintenance for repair — Determination of time of each station — Calculation of number of stations — Calculation of surfaces — Planning and scheduling jobs — Tools and equipment — Stores — Assistant workshops — Parking area — Administration, Maintenance economy — Workshop analysis and evaluation: Maintenance system. Organization of maintenance resources: Elements of maintenance resources — Management system.

MEA 413 CH VEHICLE REPAIR

Types of repair — Symptoms of engine weir — Frequency of major overhaul — Engine removal and installation — Dismantling of engine — Tightening and dismantling torque — Extraction and insertion tools — Inspection of main parts of engine — Piston — Piston rings — Connecting rod — Cylinder head — Valves — Crankshaft — Bearings — etc... Operations done in the major overhaul — Clearances — Replacement of parts — Machining of parts — Assembly of engine parts — Testing of engine — Body Repair — Major repair on different car components.

MEA 414 CH MAINTENANCE ENGINEERING

Fuel system — Fuel pump tests: Compression test, Vacuum test, Quantity test, Troubles of the fuel system and Electrical fuel pump — Troubles carburetor: starting carburetor, Main jet, Acceleration pump, Economizer valve, Troubles of idling and Partial load — Filters: Air filter, Fuel filter and Oil filter — Diesel Fuel pump: Kinds of pumps and Troubles — Cooling system: Pump, Radiator thermostat and Troubles — Lubrication system: Pump, Filter and Troubles — Ignition system: Battery, Starter, Ignition coil, Distributor, Spark plugs, Electronic systems — Auxiliary systems — Starting circuit — Charging of battery — Engine tuning and testing of performance — Maintenance of brakes — Maintenance of steering system.

MEA 422 CF AUTOMOTIVE ENGINEERING (2)

Dynamic performance of commercial vehicles — Fuel economy — Hydrodynamic transmission performance and the automatic gear box — Braking performance of commercial vehicles — Principles of anti - Lock braking systems. (ABS) — Dynamic performance of off-road vehicles: Limited slip differentials — Ride characteristics of vehicle — Human response to vibration and ISO Standards — Rigid body modes of vehicles — Vehicle ride models — Ride comfort criterion — Handling characteristics of vehicles: concepts of over, Under and neutral steering — steady state and transient response for steering inputs and other input sources — Directional stability — Four wheel steering — Steering of tracked vehicles.

MEA 433 CF AUTOMOTIVE DESIGN (3)

Cylinder block: Construction design parameters, Types of liners, Thermal and mechanical stresses — Cylinder Head: Construction, Intake and exhaust ducting, Thermal, Mechanical stresses — Fixed end — Simply supported plates solution — Tightening of leaks in combustion chambers — Pistan assembly: Construction, Types of pistons, Stresses acting on curved beams and validation stresses and Piston thermal stresses — Connecting Rods: Construction — Types of connecting rods: Petrol and diesel engines — Kinematics — Induced inertia forces — Thin closed rings stresses — Valve gear train: Construction —

Crankshaft: Construction — Effect of lubrication criterion on journal bearing geometrical parameters — Balancing.

MEA 434 CH VEHICLE AUTOMATIC CONTROL SYSTEMS

Mathematical foundation for linear time — Invariant control system — Transfer function — Block diagrams and signal flow graphs — Mathematical modeling of physical systems: mechanical — Pneumatic — State variable analysis of linear dynamic systems — State diagram and its application to control systems — State diagrams for systems transfer functions — Stability of linear control systems — Time domain analysis and design of control system — System characterization — Overshoot setting time... — Root — Locus technique — Frequency domain design of control system — Frequency domain plots — Bode diagram.

MEA 450 CF PROJECT

Planning of service stations for different types of vehicles — Feasibility study of constructing a service station — Feasibility study of constructing a factory for the assembly of a certain type of vehicle — Transformation of a petrol engine to an engine that uses natural gas — Design of vehicle components — Design and construction of a vehicle with certain specifications (Refrigerator vehicle-beach vehicle — Construction of a Hoover craft — Study and reduction of pollution from vehicles — Construction — Assembly and testing of the performance of an engine and preparing it for loads and full speeds.

MEA 461 EH CAR ELECTRONICS

Application of electronics in modern cars — Integrated circuits — Applications in cars: Sensors and their signal processing — Display technologies — Information technology — Technology of using software in engine control — Instruments used in electronic measurements — Electronic systems in car engines — Engine control module — Electronic systems in car chassis: Automatic gear box — Antilock brake systems — Wheel anti slip systems — Wheel anti _skid systems — Differential lock systems — Steering — Crash avoidance systems: Forward sensing — Rear near obstacle detection — Driver warning: visual — Aural — Tactile — Suspension — Car body — Air bag module — Driver information and display — Air conditioning system — Others.

MEA 462 EH ANALYSIS OF CAR ACCIDENTS

Motion: Kinetics and dynamics — Center of mass of cars — Laws of momentum and energy conservation — Automotive Performance and Stability — Understanding collision damage Characteristics of automotive damage — Primary and secondary damage — Direct damage. Fundamentals of damage appraisal— Repair procedure and techniques — Collision damage and car safety — Accident investigation.

MEA 463 EH HEAVY VEHICLE DYNAMICS

Two- axle straight truck — Modeling — Tires — Handling characteristics: Linear and non, Linear — Braking and brake systems — Articulated vehicles: Description of various configurations — Articulation mechanisms: Pintle-hook — Fifth wheel — King pin — Directional stability — Tractor — Semi trailer: Modeling — Stability analysis — Braking — Jackknifing — Track full — trailer — Modeling — Stability analysis — Rearward amplification — Rollover mechanisms — single axle — Multi axle — Off tracking and road geometry — Low speed — Steady state high speed — Transient high speed.

MEA 464 EH VEHICLE MANUFACTURE

Industry basis — Feasibility study —Plan of production — Classification of suppliers — Manufacturing operations: Application on the production of car parts — Production lines —

Man- hour — Time of each station — Final production lines — Inspecting and testing of parts and of final products.

MEA 465 EH EARTH MOVING AND CONSTRUCTION EQUIPMENT

Theory of earth moving and cutting equipment — Types — Performance — Productivity and control of Bulldozers — Scrapers — Graders — Excavators — Theory of earth compaction: Types, Performance, Productivity of Equipment for heating — Pumping — Transportation of Bituminous — Rood surface recycling — Asphalt mixtures and finishers — Concrete mixing — Transportation and pumping equipment — Leveling and compacting the earth — Equipment for concrete spreading — Cranes — Tests: Measurement of total weight — Linear and angular velocities — Torque — Power and acceleration.

MEA 466 EH MATERIAL HANDLING EQUIPMENT

General theory of conveying machines — Components and parts of conveying machines — Belt conveyors — Apron conveyors — Flight conveyors — V-bucket — Pivoted bucket and swing tray conveyors — Overhead conveyors — Car or platform conveyors — Screw conveyors — Roller conveyors — Oscillating and vibrating — Conveyors. Pneumatic conveyors — Hydraulic conveyors — Transport inside factories — Loaders — Hoppers and their mechanical equipment — Chutes — Uses of conveying machines.

MEA 467 EH BRAKE SYSTEMS

Braking systems: Service braking, Parking braking, Automatic braking, Hydraulic retarder, Exhaust braking and Electrodynamics retarders — Legal regulations — Brake circuit configurations — Braking systems for passenger cars — Braking medium and heavy commercial vehicles — Automatic load sensitive devices — Automatic adjustment of brake shoe clearance — Warning systems for minimum lining thickness — Energy supplying systems: vacuum systems — air compressors — Pressure regulators — Control device — Transmission device — Brake cylinders — Servo cylinders air dryers — Brake valves — Service brake valve — Parking brake valves — Duo — Drum brakes — Duo duplex — Duo servo — Anti lock Brake systems for passenger and commercial vehicles.

13- COURSES OFFERED ON HUMANITIES AND SOCIAL SCIENCES

HUM 010 CH TECHNICAL ENGLISH LANGUAGE

The text used is based on practice. It gives learners access to real language through a rich mixture of highly readable authentic texts selected from recently published sources — Both british and american. The material reflects the stylistic variety that advanced learners have to be able to deal with. the course gives practice in specific points of grammar to consolidate and extend learners existing knowledge. The analysis of syntax helps learners to develop their reading and comprehension skills. Skimming and scanning exercises develop the learners skills. Comprehension questions to test his understanding — Interpretation and implication. the activities and games used to develop listening — Speaking and writing skills through a communicative — Functional approach — With suggested topics for discussion and exercises in summary writing and composition.

HUM 020 CH HISTORY OF ENGINEERING AND TECHNOLOGY

Definition of art — Science — Engineering and technology. Techniques: history of techniques — methods and tools employed to satisfy needs through exploitation of human

and physical resources. Technology as a science of means of producing goods and industrial services needed to control the natural environment — Appeared in the middle ages — The concept of technological environmental system in the modern times. Relationship between engineering and environmental development. The system is self reproducing — Symptoms of the technological system — Division of specialized lobar — The social relations are developed through technology — Increase of productive capacity and improvement of productivity — Technology transfer: vertically from the industrial to the developing nations. Horizontally within the developing nations — The technological gap between the industrial and developing nations — Technology assessment: in the fields of agriculture — Manufacture and environment. Policy and programs — Invention and technological innovation. Their roles in development and incentives to promote them. Examples on development of engineering activities.

HUM 111 CH TECHNICAL REPORT WRITING

HUM 311 CH TECHNICAL REPORT WRITING

HUM 411 CH TECHNICAL REPORT WRITING

This course aims to give the student the basic rudiments of report writing. the rationale bases for report writing — The structure of reports — And other details such as physical appearance and linguistic style will be discussed. in addition to writing reports — Students will also be given supplementary exercises — As necessary — To enhance their general writing skills.

HUM 121 CH LEGISLATION AND CONTRACTS

HUM 321 CH LEGISLATION AND CONTRACTS

HUM 421 CH LEGISLATION AND CONTRACTS

The program aims to furnish legal orientations for engineers of all fields to clarify their responsibilities and rights within the triangular relation between: engineer — Client and contractor — That will be fulfilled through: demonstration of laws and legislation concerning engineering works of any field (theoretically and with applied examples — Provision of essential references as: Engineers syndicate — Contractors — Low of urban planning — Laws of buildings legislation — Street occupations — Land real state divisions — Agrarian land protection — river transportation — Traffic (Urban and outskirts) — Industrial safety and security — Fire conditions — Lifts conditions — New agglomerations — environmental protection against pollution — Work — Insurance against fire — Accidents — Crisis — Law of investment — irrigation and river banks — Relation between the owner and the tenant — Job laws — Industries union laws.

HUM 222 CH PROJECT MANAGEMENT

HUM 322 CH PROJECT MANAGEMENT

HUM 422 CH PROJECT MANAGEMENT

Definition of project — Project as a part of strategic plans — Project as a natural and effective planning device — The relationships between programs — Projects — Budgets — And organizational plans — Managerial process — Project planning — Quantitative techniques of project management (Such as PERT and CPM) — Project requirements: materials manpower — facilities — And finance — Project scheduling — Project organization — Project implementation — Project control and performance evaluation.

HUM 223 CH ECONOMICS

HUM 323 CH ECONOMICS

Theory of consumer behavior and demands: theory of utility and performance — Theory of consumer behavior — Market demand — Theories of production and cost — Cost estimation — Forecasting — Theory of the firm and market organization: Theory of price in perfect competitive markets, Theory of price under pure monopoly, Theory of price under monopolistic competition. Theory of distribution: Marginal productivity theory of distribution in perfectly competitive markets — Theory of employment in perfect and imperfect competitive markets — determination of real output and price level — Inflation and unemployment — Government budget — Decision making under uncertainty — Capital budgeting.

HUM 426 CH ENVIRONMENTAL CONTROL

Effects of industrial wastes and drainage on the environmental pollution — Methods of control and treatment of industrial wastes — Impact of pollution on human beings — Methods of control of obnoxious effects of air and water pollution — Environmental effects of power generation schemes and methods of their combatting — Cement dust pollution and methods of protection of the environment against it — Impact of the marine environment on coastal regions and means of control to reduce its bad effects.

HUM X30 EH AESTHETICS

The appreciation of art and beauty — The relations of art and nature — Art and society — Art and industry — Art as expression and as imagination — Art and innovation — Applications to plastic arts.

HUM X31 EH LITERARY APPRECIATION

The theory of imagination — Imagination and literary — Theatrical story — Poetic — Linguistic expression — Artistic appreciation of prose and poetry.

HUM X32 EH PHILOSOPHIC THOUGHT

Philosophical thought as an aid to understand reality — The transformation of thought into action — Methods of philosophical approach — Negotiation. Multi-vision approach to problems. Expressions and concepts — Philosophical approaches — Existentialism — Analytic and historical approaches — Discard and the concept of doubt.

HUM X33 EH SCIENTIFIC THOUGHT

Symptoms of scientific thought — Vertical and horizontal recapitulation — Organization — Globalism and particularity — Precision — Abstraction — Method and observation — Hypothesis — Experimentation — Partial rules — General theory and induction — Moral elements in the scientific mind: Critical spirit — Impartiality — Integrity.

HUM X40 EH MANAGEMENT AND MARKETING

Part one; Management: Definition of management — Management as both art and science — Levels and types of management — Management functions: planning organizing — Staffing, leading — Controlling — Decision making — Fundamentals of organizational design — Fundamentals of control — Total quality management — Part two: Marketing — Definition of marketing — Goals of marketing system — Structure of marketing systems — Marketing role in the company: Strategic planning and the marketing process and system — Marketing information system, Consumer Markets and buying behavior — Pricing strategy — Marketing channels — Marketing communications advertising — Sales promotion — Publicity.

HUM X41 EH CONTEMPORARY ECONOMIC SYSTEMS

Definition of economic systems — Classical economic systems — Capitalism: Characteristics, advantages, Disadvantages and policies — Contemporary systems are mixed systems — economic policies for mixed systems: Financial (Taxes and governmental spending), Monetary (Control of the money supply and interest rates), commercial.

HUM X42 EH ENVIRONMENT AND SOCIETY SERVICES

Community development — Plan and purpose of community service and development — Training schemes for small trades and their marketing — Infrastructure project development (E.g. roads, Potable water, Plant maintenance, Canal sanitation). Methods of development of small projects to raise productivity — ensuring continuity and increase employment — operation and training — Environmental development: Evaluation of environmental impact of projects — Role of universities in dealing with environmental problems and the development of the environment. Nutrition and pollution and their relation to the development of the environment — Legal and regulation considerations for protection of the environment.

HUM X43 EH INTERNATIONAL RELATIONS

Definition of international relations — Framework of international relations: Political, Economical, Social, Legal, Environmental, Military, Cultural, Arts ... etc. International economic relations: Movements of goods and services (Exports and imports), Movements of international labor, Movements of capital (Direct and indirect foreign investments). Subsidies — Short and long term loans — International organizations: United Nations, International bank for reconstruction and development (World bank), International monetary fund (IMF), International treaties such as general agreement on tariffs and trade (GATT).