Faculty of Engineering

Curriculum Plan for Credit Hours System Postgraduate Program at 2007

(Applied 2008)

LIST OF POSTGRADUATE COURSES

1- Department of Engineering Physics & Mathematics

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	PHM	400	Modern Physics	70	30	0	100	3	3
02	PHM	401	Quantum Mechanics	70	30	0	100	3	3
03	PHM	402	Solid State Physics	70	30	0	100	3	3
04	PHM	403	Statistical Thermodynamics	70	30	0	100	3	3
05	PHM	404	Semiconductor Physics	70	30	0	100	3	3
06	PHM	405	Physics of Semiconductor Devices	70	30	0	100	3	3
07	PHM	406	Electrodynamics (1)	70	30	0	100	3	3
08	PHM	407	Geometrical and Physical Optics	70	30	0	100	3	3
09	PHM	408	Physics of Dielectrics	70	30	0	100	3	3
10	PHM	409	Atomic Physics (1)	70	30	0	100	3	3
11	PHM	410	Nuclear Physics (1)	70	30	0	100	3	3
12	PHM	411	Materials Science	70	30	0	100	3	3
13	PHM	412	Plasma Physics (1)	70	30	0	100	3	3
14	PHM	413	Computational Physics	70	30	0	100	3	3
15	PHM	440	Linear Algebra (1)	70	30	0	100	3	3
16	PHM	441	Abstract Algebra (1)	70	30	0	100	3	3
17	PHM	442	Real Analysis (1)	70	30	0	100	3	3
18	PHM	443	Functions of Complex Variable (1)	70	30	0	100	3	3
19	PHM	444	Ordinary Differential Equations (1)	70	30	0	100	3	3
20	PHM	445	Partial Differential Equations (1)	70	30	0	100	3	3
21	PHM	446	Numerical Analysis (1)	70	30	0	100	3	3
22	PHM	447	Probability and Statistics (1)	70	30	0	100	3	3
23	PHM	448	Computer Science (1)	70	30	0	100	3	3
24	PHM	449	Operations Research (1)	70	30	0	100	3	3
25	PHM	450	Differential Geometry (1)	70	30	0	100	3	3
26	PHM	451	Projective Geometry (1)	70	30	0	100	3	3
27	PHM	480	Analytical Mechanics (1)	70	30	0	100	3	3
28	PHM	481	Fluid Mechanics	70	30	0	100	3	3
29	PMH	482	Elasticity and Piasticity	70	30	0	100	3	3
30	PHM	483	Theoretical Mechanics	70	30	0	100	3	3
31	PHM	484	Introduction To Vibrations and Acoustics	70	30	0	100	3	3
32	PMH	485	Special Topics In Engineering Mechanics	70	30	0	100	3	3
33	PHM	540	General Engineering Mathematics (1)	70	30	0	100	3	3
34	PHM	541	General Engineering Mathematics (2)	70	30	0	100	3	3
35	PHM	542	General Engineering Mathematics (3)	70	30	0	100	3	3
36	PHM	543	Engineering Statistics	70	30	0	100	3	3
37	PHM	544	Difference Equations (1)	70	30	0	100	3	3
38	PHM	580	Aerodynamics	70	30	0	100	3	3
39	PHM	581	Vibration Mechanics (1)	70	30	0	100	3	3
40	PMH	582	Analytical Mechanics (2)	70	30	0	100	3	3
41	PHM	583	Continuum Mechanics	70	30	0	100	3	3
42	PHM	600	Advanced Solid State Physics	70	30	0	100	3	3
43	PHM	601	Advanced Quantum Mechanics	70	30	0	100	3	3
44	PHM	602	Solid State Electronics	70	30	0	100	3	3

1- Department of Engineering Physics & Mathematics

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
45	PHM	603	Physics of Advanced Semiconductor Devices	70	30	0	100	3	3
46	PHM	604	Optical Properties of Semiconductors	70	30	0	100	3	3
47	PHM	605	Introduction to Lasers and Electro-Optics	70	30	0	100	3	3
48	PHM	606	Opto-Electronic Devices	70	30	0	100	3	3
49	PHM	607	Semiconductor Diode Laser Physics	70	30	0	100	3	3
50	PHM	608	Solar cells	70	30	0	100	3	3
51	PHM	609	Microwave Devices	70	30	0	100	3	3
52	PHM	610	Advanced Laser Physics	70	30	0	100	3	3
53	PHM	611	Photo-Electrochemical Properties of Semiconductors	70	30	0	100	3	3
54	PHM	612	Solid State Devices	70	30	0	100	3	3
55	PHM	613	Mesoscopic Physics	70	30	0	100	3	3
56	PHM	614	Quantum Theory of Nanostructures	70	30	0	100	3	3
57	PHM	615	Nanostructure and Nanomaterials Synthesis, Properties and Applications	70	30	0	100	3	3
58	PHM	616	Transport Theory in Materials	70	30	0	100	3	3
59	PHM	617	Quantum Transport	70	30	0	100	3	3
60	PHM	618	Simulation and Modeling of Semiconductor Devices	70	30	0	100	3	3
61	PHM	619	VLSI and Nanoscale Technologies	70	30	0	100	3	3
62	PHM	620	Electrodynamics (2)	70	30	0	100	3	3
63	PHM	621	Numerical Methods for Light Propagation	70	30	0	100	3	3
64	PHM	622	Light Polarization	70	30	0	100	3	3
65	PHM	623	Optical Devices	70	30	0	100	3	3
66	PHM	624	Physical Properties of Thin Films	70	30	0	100	3	3
67	PHM	625	Thin Film Technology	70	30	0	100	3	3
68	PHM	626	Thin Film Devices and Sensors	70	30	0	100	3	3
69	PHM	627	Surface Properties of Solids	70	30	0	100	3	3
70	PHM	628	Special Theory of Relativity	70	30	0	100	3	3
71	PHM	629	Theoretical Physics	70	30	0	100	3	3
72	PHM	630	Atomic Physics (2)	70	30	0	100	3	3
73	PHM	631	Elementary Particle Physics	70	30	0	100	3	3
74	PHM	632	Plasma Physics (2)	70	30	0	100	3	3
75	PHM	633	Nuclear Physics (2)	70	30	0	100	3	3
76	PHM	634	Reactor Physics	70	30	0	100	3	3
77	PHM	635	Resonance Particle Physics	70	30	0	100	3	3
78	PHM	636	Mathematical Physics	70	30	0	100	3	3
79	PHM	637	Selected Topics in Advanced Physics	70	30	0	100	3	3
80	PHM	640	Functions of Complex Variable (2)	70	30	0	100	3	3
81	PHM	641	Special Functions	70	30	0	100	3	3
82	PHM	642	Ordinary Differential Equations (2)	70	30	0	100	3	3
83	PHM	643	Integral Transforms	70	30	0	100	3	3
84	PHM	644	Integral Equations	70	30	0	100	3	3
85	PHM	645	Operator Theory	70	30	0	100	3	3

1- Department of Engineering Physics & Mathematics

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
86	PHM	646	Probability and Statistics (2)	70	30	0	100	3	3
87	PHM	647	General Topology	70	30	0	100	3	3
88	PHM	648	Computer Science (2)	70	30	0	100	3	3
89	PHM	649	General Applied Mathematics	70	30	0	100	3	3
90	PHM	650	Discrete Mathematics	70	30	0	100	3	3
91	PHM	651	Graph Theory	70	30	0	100	3	3
92	PHM	652	Operations Research (2)	70	30	0	100	3	3
93	PHM	653	Finite Element Methods	70	30	0	100	3	3
94	PHM	654	Abstract Algebra (2)	70	30	0	100	3	3
95	PHM	655	Real Analysis (2)	70	30	0	100	3	3
96	PHM	656	Functional Analysis	70	30	0	100	3	3
97	PHM	657	Partial Differential Equations (2)	70	30	0	100	3	3
98	PHM	658	Numerical Analysis (2)	70	30	0	100	3	3
99	PHM	659	Projective Geometry (2)	70	30	0	100	3	3
100	PHM	660	Differential Geometry (2)	70	30	0	100	3	3
101	PHM	661	Four Dimensional Descriptive Geometry	70	30	0	100	3	3
102	PHM	662	Advanced Descriptive Geometry	70	30	0	100	3	3
103	PHM	663	Advanced Engineering Mathematics (1)	70	30	0	100	3	3
104	PHM	664	Advanced Engineering Mathematics (2)	70	30	0	100	3	3
105	PHM	665	Engineering Numerical Analysis	70	30	0	100	3	3
106	PHM	666	Engineering Probability and Statistics	70	30	0	100	3	3
107	PHM	667	Special Topics in Higher Mathematics (1)	70	30	0	100	3	3
108	PHM	668	Special Topics in Higher Mathematics (2)	70	30	0	100	3	3
109	PHM	669	Operations Research (3)	70	30	0	100	3	3
110	PHM	670	Real Analysis (2)	70	30	0	100	3	3
111	PHM	671	Real Analysis (3)	70	30	0	100	3	3
112	PHM	672	Difference Equations (2)	70	30	0	100	3	3
113	PHM	680	Special Topics In Mechanics	70	30	0	100	3	3
114	PMH	681	Statistical Mechanics	70	30	0	100	3	3
115	PHM	682	Vibration Mechanics (2)	70	30	0	100	3	3
116	PHM	683	Theory of Elasticity	70	30	0	100	3	3
117	PMH	684	Space Mechanics	70	30	0	100	3	3
118	PHM	685	Nonlinear and Random Vibration Mechanics	70	30	0	100	3	3
119	PHM	686	Theory of Plates	70	30	0	100	3	3
120	PMH	687	Theory of Shells	70	30	0	100	3	3

2- Department of Structural Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	CES	510	Numerical Analysis in Structural Engineering	70	30	0	100	3	3
02	CES	511	Advanced Structural Analysis	70	30	0	100	3	3
03	CES	512	Dynamics of Structures	70	30	0	100	3	3
04	CES	513	Theory of Elasticity in Structural Engineering	70	30	0	100	3	3
05	CES	514	Plastic Analysis of Structures	70	30	0	100	3	3
06	CES	515	Computer Analysis of Structures	70	30	0	100	3	3
07	CES	516	Introduction to Solid Mechanics	70	30	0	100	3	3
08	CES	517	Stability of Steel Structures (1)	70	30	0	100	3	3
09	CES	520	Properties and Testing of Materials	70	30	0	100	3	3
10	CES	521	Statistics in Structural Engineering	70	30	0	100	3	3
11	CES	522	Experimental Stress Analysis and Strain Measurement	70	30	0	100	3	3
12	CES	523	Methods of Repair and Strengthening	70	30	0	100	3	3
13	CES	524	Quality Control and Quality Assurance	70	30	0	100	3	3
14	CES	525	Effect of Materials Manufacture on Environment	70	30	0	100	3	3
15	CES	526	Special Types of Concrete	70	30	0	100	3	3
16	CES	527	Deterioration and Durability of Concrete	70	30	0	100	3	3
17	CES	528	Advanced Construction Materials	70	30	0	100	3	3
18	CES	529	Fracture Mechanics and Fatigue	70	30	0	100	3	3
19	CES	530	Modern Concrete Bridges	70	30	0	100	3	3
20	CES	531	Prestressed Concrete Structures	70	30	0	100	3	3
21	CES	532	Analysis and Design of Special Concrete Structures	70	30	0	100	3	3
22	CES	533	Computer in RC Structures	70	30	0	100	3	3
23	CES	540	Geological Engineering & Rock Mechanics	70	30	0	100	3	3
24	CES	541	Site Investigation and Laboratory Testing	70	30	0	100	3	3
25	CES	542	Soil Structures	70	30	0	100	3	3
26	CES	543	Advanced Foundation Engineering	70	30	0	100	3	3
27	CES	544	Ground Improvement	70	30	0	100	3	3
28	CES	545	Environmental Geotechnique	70	30	0	100	3	3
29	CES	546	Dewatering	70	30	0	100	3	3
30	CES	550	Special Steel Structures (1)	70	30	0	100	3	3
31	CES	551	Fabrication, Erection and Maintenance of Steel Structures	70	30	0	100	3	3
32	CES	552	Behavior of Steel Structures (1)	70	30	0	100	3	3
33	CES	553	Stability of Steel Structures (2)	70	30	0	100	3	3
34	CES	554	Design of Steel Transmission and Antenna Towers (1)	70	30	0	100	3	3
35	CES	555	Advanced Design of Steel Bridges (1)	70	30	0	100	3	3
36	CES	556	Plastic Analysis and Design of Steel Structures	70	30	0	100	3	3
37	CES	557	Steel Plated Structures	70	30	0	100	3	3
38	CES	558	Thin Walled Steel Structures (1)	70	30	0	100	3	3

2- Department of Structural Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
39	CES	560	Bids and Contracts	70	30	0	100	3	3
40	CES	562	General Management in Construction Projects (1)	70	30	0	100	3	3
41	CES	564	Projects Planning and Control (1)	70	30	0	100	3	3
42	CES	565	Projects Planning and Control (2)	70	30	0	100	3	3
43	CES	566	Construction Equipment	70	30	0	100	3	3
44	CES	567	Matrix Analysis of Structures	70	30	0	100	3	3
45	CES	568	Computer-Aided Analysis and Design of Framed Structures	70	30	0	100	3	3
46	CES	569	Computer-Aided Structrual Engineering	70	30	0	100	3	3
47	CES	601	Advanced Structural Modeling	70	30	0	100	3	3
48	CES	602	Advanced Structural Design	70	30	0	100	3	3
49	CES	603	Advanced Engineering Programming Methods	70	30	0	100	3	3
50	CES	604	Computational Methods in Structural Mechanics	70	30	0	100	3	3
51	CES	605	Non-Linear Finite Element Methods	70	30	0	100	3	3
52	CES	610	Theory of Plasticity	70	30	0	100	3	3
53	CES	611	Wind and Earthquakes Engineering	70	30	0	100	3	3
54	CES	612	Plates and Shells	70	30	0	100	3	3
55	CES	613	Finite Element Method	70	30	0	100	3	3
56	CES	614	Suspension and Guyed Structures	70	30	0	100	3	3
57	CES	620	Facilities for Renewable Energy	70	30	0	100	3	3
58	CES	621	Advanced Quality Control Approach for Concrete Structures	70	30	0	100	3	3
59	CES	622	Evaluation and Rehabilitation of Concrete Structures	70	30	0	100	3	3
60	CES	623	Advanced Methods for Repair and Strengthening of Structures	70	30	0	100	3	3
61	CES	624	Testing of Products and Structures	70	30	0	100	3	3
62	CES	625	Recycling and Reuse of Wastes in Construction Fields	70	30	0	100	3	3
63	CES	626	Concrete for Special Applications	70	30	0	100	3	3
64	CES	627	Durability of Construction Materials in Different Environments	70	30	0	100	3	3
65	CES	628	Properties and Technology of Advanced Composite Materials	70	30	0	100	3	3
66	CES	629	629 Fracture Mechanics in Fatigue Analysis	70	30	0	100	3	3
67	CES	630	Non-Linear Analysis of Concrete Structures	70	30	0	100	3	3
68	CES	631	High Rise Buildings	70	30	0	100	3	3
69	CES	632	Advanced Analysis of Special Concrete Structures	70	30	0	100	3	3
70	CES	633	Skin Concrete Structures	70	30	0	100	3	3
71	CES	634	Behavior & Design of Masonary Structures	70	30	0	100	3	3
72	CES	640	Advanced Soil Mechanics	70	30	0	100	3	3

2- Department of Structural Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
73	CES	641	Underground Structures	70	30	0	100	3	3
74	CES	642	Soil Dynamics	70	30	0	100	3	3
75	CES	643	Numerical Modeling in Geomechanical Engineering	70	30	0	100	3	3
76	CES	644	Rock Engineering	70	30	0	100	3	3
77	CES	645	Special Topics in Geotechnical Engineering	70	30	0	100	3	3
78	CES	650	Stability of Plane Frameworks	70	30	0	100	3	3
79	CES	651	Advanced Design of Steel Bridges (2)	70	30	0	100	3	3
80	CES	653	Special Steel Structures (2)	70	30	0	100	3	3
81	CES	654	Behavior of Steel Structures (2)	70	30	0	100	3	3
82	CES	655	Design of Steel Transmission and Antenna Towers (2)	70	30	0	100	3	3
83	CES	656	Thin Walled Steel Structures (2)	70	30	0	100	3	3
84	CES	657	Design of Offshore Structures	70	30	0	100	3	3
85	CES	658	Design of Space Steel Structures	70	30	0	100	3	3
86	CES	659	Engineering Economics	70	30	0	100	3	3
87	CES	660	Resources Management	70	30	0	100	3	3
88	CES	661	System Analysis For Civil Engineering	70	30	0	100	3	3
89	CES	662	Accounting and Costing	70	30	0	100	3	3
90	CES	663	Productivity in Construction	70	30	0	100	3	3
91	CES	664	Construction Management (2)	70	30	0	100	3	3
92	CES	665	Risk and Safety Management	70	30	0	100	3	3
93	CES	666	Operations Research and Value Engineering	70	30	0	100	3	3
94	CES	667	Information Management System	70	30	0	100	3	3
95	CES	668	Environmental Management	70	30	0	100	3	3
96	CES	669	Special Topics in Construction Engineering	70	30	0	100	3	3
97	CES	670	Advanced Topics in Construction Engineering	70	30	0	100	3	3
98	CES	672	Construction Systems and Methods	70	30	0	100	3	3
99	CES	673	Construction of Temporary Works	70	30	0	100	3	3
100	CES	674	Use of Fiber Reinforced Polymers (FRP) Materials in Reinforced Concrete Structures	70	30	0	100	3	3
101	CES	675	Fire Protection of Structures	70	30	0	100	3	3
102	CES	676	Use of High – Strength Concrete in RC Structures	70	30	0	100	3	3
103	CES	677	Advanced Prestressed Concrete	70	30	0	100	3	3
104	CES	680	Earthquake Hazard Assessment	70	30	0	100	3	3
105	CES	681	Uncertainty Modeling in Earthquake Losses	70	30	0	100	3	3
106	CES	682	Earthquake Structural Dynamics	70	30	0	100	3	3
107	CES	683	Earthquake Soil Dynamics	70	30	0	100	3	3
108	CES	684	Advanced Numerical Analysis	70	30	0	100	3	3
109	CES	685	Earthquake Assessment and Design of Buildings and Bridges	70	30	0	100	3	3
110	CES	686	Geotechnical Earthquake Engineering	70	30	0	100	3	3
111	CES	687	Engineering Fragility Analysis	70	30	0	100	3	3
112	CES	688	Network Performance Assessment	70	30	0	100	3	3

2- Department of Structural Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
113	CES	689	Information Technology Implementation and Grid Technology	70	30	0	100	3	3
114	CES	690	Inventory Technologies and Data Management	70	30	0	100	3	3
115	CES	691	Social and Economic Impact Analysis	70	30	0	100	3	3
116	CES	692	Decision-Making Methodologies	70	30	0	100	3	3
117	CES	693	Mitigation of Earthquake Losses – Engineering Action	70	30	0	100	3	3
118	CES	694	Mitigation of Earthquake Losses – Socio-Economic Action	70	30	0	100	3	3
119	CES	695	Comprehensive Project – 'From Source to Society'	70	30	0	100	3	3
120	CES	696	Loss Assessment Software and Grid Technology	70	30	0	100	3	3
121	CES	P98	Project (1)	70	30	0	100	3	3
122	CES	P99	Project (2)	70	30	0	100	3	3

3- Department of Irrigation and Hydraulics

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	CEI	501	Hydrodynamics	70	30	0	100	3	3
02	CEI	502	Hydraulic Engineering	70	30	0	100	3	3
03	CEI	503	Open Channel Flow (1)	70	30	0	100	3	3
04	CEI	504	Sediment Transport (1)	70	30	0	100	3	3
05	CEI	505	Hydraulics of Pipelines	70	30	0	100	3	3
06	CEI	506	Engineering Hydrology (1)	70	30	0	100	3	3
07	CEI	507	Groundwater Hydrology (1)	70	30	0	100	3	3
08	CEI	508	Surface Water Hydrology (1)	70	30	0	100	3	3
09	CEI	509	Water Resources Engineering	70	30	0	100	3	3
10	CEI	510	Information Systems and Water Resources Management (1)	70	30	0	100	3	3
11	CEI	511	Irrigation and Drainage Engineering	70	30	0	100	3	3
12	CEI	512	Advanced Irrigation and Drainage Engineering (1)	70	30	0	100	3	3
13	CEI	513	Modern Irrigation Systems and Management and Maintenance of Irrigation	70	30	0	100	3	3
14	CEI	514	Hydraulic Structures (1)	70	30	0	100	3	3
15	CEI	515	Dams Engineering (1)	70	30	0	100	3	3
16	CEI	516	Coastal and Harbour Engineering	70	30	0	100	3	3
17	CEI	517	Ocean Wave Mechanics and Basics of Shore Changes Processes	70	30	0	100	3	3
18	CEI	518	Inland Navigation	70	30	0	100	3	3
19	CEI	519	Water Environment Engineering and Water Quality	70	30	0	100	3	3
20	CEI	520	Environmental Impact Assessment of Water Resources Projects	70	30	0	100	3	3
21	CEI	521	Coastal Environment Engineering	70	30	0	100	3	3
22	CEI	522	Topics in Water Resources Management and Environment	70	30	0	100	3	3
23	CEI	523	Topics in Hydraulics Engineering and Water Structures	70	30	0	100	3	3
24	CEI	524	Topics in Irrigation and Drainage Engineering	70	30	0	100	3	3
25	CEI	525	Topics in Harbour and Coastal Engineering	70	30	0	100	3	3
26	CEI	526	Project	70	30	0	100	3	3
27	CEI	527	Basics of Water Quality	70	30	0	100	3	3
28	CEI	528	Experimental Fluid Mechanics	70	30	0	100	3	3
29	CEI	529	Hydrometry (1)	70	30	0	100	3	3
30	CEI	530	Engineering Hydraulics Laboratory (1)	70	30	0	100	3	3
31	CEI	531	Advanced Drainage Engineering	70	30	0	100	3	3
32	CEI	532	Pump Station Engineering	70	30	0	100	3	3
33	CEI	533	Management And Maintenance of Irrigation Projects	70	30	0	100	3	3
34	CEI	601	Advanced Fluid Mechanics	70	30	0	100	3	3
35	CEI	602	Topics in Fluid Mechanics and Hydraulics	70	30	0	100	3	3
36	CEI	603	Advanced Hydraulics	70	30	0	100	3	3
37	CEI	604	Open Channel Flow (2)	70	30	0	100	3	3

3- Department of Irrigation and Hydraulics

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
38	CEI	605	Hydraulic and Environmental Modeling	70	30	0	100	3	3
39	CEI	606	Sediment Transport (2)	70	30	0	100	3	3
40	CEI	607	River Engineering	70	30	0	100	3	3
41	CEI	608	Hydrologic Systems Analysis	70	30	0	100	3	3
42	CEI	609	Engineering Hydrology (2)	70	30	0	100	3	3
43	CEI	610	Surface Water Hydrology (2)	70	30	0	100	3	3
44	CEI	611	Groundwater Hydrology (2)	70	30	0	100	3	3
45	CEI	612	Management and Economics of Water Resources	70	30	0	100	3	3
46	CEI	613	Information Systems and Water Resources Management (2)	70	30	0	100	3	3
47	CEI	614	Advanced Irrigation and Drainage Engineering (2)	70	30	0	100	3	3
48	CEI	615	Hydraulic Structures (2)	70	30	0	100	3	3
49	CEI	616	Dams Engineering (2)	70	30	0	100	3	3
50	CEI	617	Tunnels Engineering	70	30	0	100	3	3
51	CEI	618	Pump Stations and Hydropower Engineering	70	30	0	100	3	3
52	CEI	619	Wave Hydrodynamics	70	30	0	100	3	3
53	CEI	620	Sediment Process and Environmental Engineering in Coastal Zones	70	30	0	100	3	3
54	CEI	621	Port and Marine Structures	70	30	0	100	3	3
55	CEI	622	Marine Offshore Structures	70	30	0	100	3	3
56	CEI	623	Stream Pollution Control	70	30	0	100	3	3
57	CEI	624	Numerical Models in Hydraulics and Water Resources	70	30	0	100	3	3
58	CEI	625	Hydrometry (2)	70	30	0	100	3	3
59	CEI	626	Engineering Hydraulics Laboratory (2)	70	30	0	100	3	3

4- Department of Public Works

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	CEP	500	Modern Methods of Railway Stations Planning	70	30	0	100	3	3
02	CEP	502	Digital Terrain Models and Applications	70	30	0	100	3	3
03	CEP	503	Non-Topographic Photogrammetric Surveying	70	30	0	100	3	3
04	CEP	504	Map Production	70	30	0	100	3	3
05	CEP	505	Techniques for Surveying Data Collections	70	30	0	100	3	3
06	CEP	506	Cartography and Cadastral Surveying	70	30	0	100	3	3
07	CEP	507	Digital Mapping Technology	70	30	0	100	3	3
08	CEP	508	Digital Image Processing	70	30	0	100	3	3
09	CEP	509	Photo Interpretation	70	30	0	100	3	3
10	CEP	510	Geometric Geodesy	70	30	0	100	3	3
11	CEP	511	Adjusting Surveying Measurements	70	30	0	100	3	3
12	CEP	512	Positions Determination Systems	70	30	0	100	3	3
13	CEP	513	Surveying For Engineering Projects	70	30	0	100	3	3
14	CEP	514	Principles of Remote Sensing	70	30	0	100	3	3
15	CEP	515	Surveying Computations and Drawing	70	30	0	100	3	3
16	CEP	516	Physical Geodesy	70	30	0	100	3	3
17	CEP	517	Analysis of Deformation Measurements in Constructions	70	30	0	100	3	3
18	CEP	518	Design and Processing of Surveying Measurements	70	30	0	100	3	3
19	CEP	519	Applications of Astronomy in Surveying	70	30	0	100	3	3
20	CEP	520	Land Information System (LIS)	70	30	0	100	3	3
21	CEP	521	Principles of Hydro-Graphic Surveying	70	30	0	100	3	3
22	CEP	522	Dynamic Geodesy	70	30	0	100	3	3
23	CEP	523	Map Projection and Coordinate Systems	70	30	0	100	3	3
24	CEP	524	Writing Surveying Reports	70	30	0	100	3	3
25	CEP	525	Management of Surveying Projects	70	30	0	100	3	3
26	CEP	526	Topographic Photogrammetric Surveying	70	30	0	100	3	3
27	CEP	530	Highway Planning and Feasibility Studies	70	30	0	100	3	3
28	CEP	531	Highway Geometric Design	70	30	0	100	3	3
29	CEP	532	Highway Construction Materials	70	30	0	100	3	3
30	CEP	533	Hydrological Studies of Highways	70	30	0	100	3	3
31	CEP	534	Structural Design of Highway Pavements	70	30	0	100	3	3
32	CEP	535	Principals of Highway Construction Documentation	70	30	0	100	3	3
33	CEP	536	Airport Planning and Design	70	30	0	100	3	3
34	CEP	537	Highway Construction Technology and Quality Control	70	30	0	100	3	3
35	CEP	538	Highway Maintenance	70	30	0	100	3	3
36	CEP	539	Highway Construction Management	70	30	0	100	3	3
37	CEP	540	Railway Capacity	70	30	0	100	3	3
38	CEP	541	Railway Alignment	70	30	0	100	3	3
39	CEP	542	Metro – Lines Alignment and Operating	70	30	0	100	3	3
40	CEP	543	Railway Track Elements Design	70	30	0	100	3	3

4- Department of Public Works

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
41	CEP	544	Rapid Speed Train Technology	70	30	0	100	3	3
42	CEP	545	Railway Turnouts Design	70	30	0	100	3	3
43	CEP	546	Railway Station Planning	70	30	0	100	3	3
44	CEP	547	Railway Signals	70	30	0	100	3	3
45	CEP	548	Railway Maintenance and Renewal	70	30	0	100	3	3
46	CEP	549	Advanced Technology of Railway Signals	70	30	0	100	3	3
47	CEP	550	Introduction to Urban Transportation Planning	70	30	0	100	3	3
48	CEP	551	Urban Transportation Planning	70	30	0	100	3	3
49	CEP	552	Public Transportation	70	30	0	100	3	3
50	CEP	553	Statistical Applications in Transportation	70	30	0	100	3	3
51	CEP	554	Freight Transportation System	70	30	0	100	3	3
52	CEP	555	Transportation Systems Analysis	70	30	0	100	3	3
53	CEP	556	Computer Applications in Transportation	70	30	0	100	3	3
54	CEP	557	Transportation Economics	70	30	0	100	3	3
55	CEP	558	Expert Systems for Transportation	70	30	0	100	3	3
56	CEP	559	Transportation Network Equilibrium	70	30	0	100	3	3
57	CEP	560	Sanitary Chemistry	70	30	0	100	3	3
58	CEP	561	Bacteriology of Water and Wastewater	70	30	0	100	3	3
59	CEP	562	Environmental Engineering and Pollution Control (1)	70	30	0	100	3	3
60	CEP	563	Water Treatment	70	30	0	100	3	3
61	CEP	564	Wastewater Treatment	70	30	0	100	3	3
62	CEP	565	Sludge Treatment	70	30	0	100	3	3
63	CEP	566	Introduction to Computer Applications in Traffic & Transportation	70	30	0	100	3	3
64	CEP	567	Projects Management and Operation	70	30	0	100	3	3
65	CEP	568	Industrial Water Supply	70	30	0	100	3	3
66	CEP	569	Industrial Wastewater Treatment	70	30	0	100	3	3
67	CEP	570	Solid Wastes	70	30	0	100	3	3
68	CEP	571	Traffic Impact Studies	70	30	0	100	3	3
69	CEP	572	Wastewater Collection Systems	70	30	0	100	3	3
70	CEP	573	Water Collection Works	70	30	0	100	3	3
71	CEP	574	Environmental Engineering and Pollution Control (2)	70	30	0	100	3	3
72	CEP	575	Master Planning for Sanitary Projects	70	30	0	100	3	3
73	CEP	576	Water Pollution	70	30	0	100	3	3
74	CEP	577	Soil Pollution	70	30	0	100	3	3
75	CEP	578	Noise & Vibrations	70	30	0	100	3	3
76	CEP	579	Air Pollution	70	30	0	100	3	3
77	CEP	580	Railway Environmental Effects	70	30	0	100	3	3
78	CEP	581	Traffic Flow Theories	70	30	0	100	3	3
79	CEP	582	Traffic Studies and Analysis	70	30	0	100	3	3
80	CEP	583	Traffic Management and Control	70	30	0	100	3	3
81	CEP	584	Traffic and Roads Impact on Environment	70	30	0	100	3	3
82	CEP	585	Traffic Systems Analysis	70	30	0	100	3	3

4- Department of Public Works

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
83	CEP	586	Traffic Flow Theories and Engineering	70	30	0	100	3	3
84	CEP	587	Statistical Applications to Traffic Operations	70	30	0	100	3	3
85	CEP	588	Traffic Accidents and Roads Safety	70	30	0	100	3	3
86	CEP	589	Advanced Traffic Control Devices	70	30	0	100	3	3
87	CEP	590	Reuse & Recycling	70	30	0	100	3	3
88	CEP	591	Engineering Economics	70	30	0	100	3	3
89	CEP	592	Environmental and Social Studies	70	30	0	100	3	3
90	CEP	593	Properties & Evaluation of Environmental Quality	70	30	0	100	3	3
91	CEP	594	Plants Performance Evaluation	70	30	0	100	3	3
92	CEP	595	Public Health	70	30	0	100	3	3
93	CEP	596	Transportation Policy and Planning	70	30	0	100	3	3
94	CEP	597	Transportation and Traffic Planning (1)	70	30	0	100	3	3
95	CEP	598	Transportation and Traffic Planning (2)	70	30	0	100	3	3
96	CEP	599	Traffic Engineering	70	30	0	100	3	3
97	CEP	602	Photo Interpretation and Digital Image Processing	70	30	0	100	3	3
98	CEP	603	Photogrammetry	70	30	0	100	3	3
99	CEP	604	Digital Maps and Map Production	70	30	0	100	3	3
100	CEP	605	Hydro-Graphic Surveying	70	30	0	100	3	3
101	CEP	606	Surveying Data Collections and Computations	70	30	0	100	3	3
102	CEP	607	Physical and Dynamic Geodesy	70	30	0	100	3	3
103	CEP	608	Geometric Geodesy and Position Determination Systems	70	30	0	100	3	3
104	CEP	609	Construction Deformation Measurements	70	30	0	100	3	3
105	CEP	610	Adjustment and Analysis of Surveying Measurements	70	30	0	100	3	3
106	CEP	611	Cartography and Map Production	70	30	0	100	3	3
107	CEP	612	Land Information Systems and Digital Terrain Models	70	30	0	100	3	3
108	CEP	613	Remote Sensing	70	30	0	100	3	3
109	CEP	614	Management and Reporting of Surveying Projects.	70	30	0	100	3	3
110	CEP	615	Infra Structure Utilities and Surveying	70	30	0	100	3	3
111	CEP	616	Application of GIS in Utilities Projects	70	30	0	100	3	3
112	CEP	617	Legal Registration and Cadastral Surveying	70	30	0	100	3	3
113	CEP	618	Digital Maps From Mobile Sensors	70	30	0	100	3	3
114	CEP	619	Quantity Survey and Its Applicants in Civil Engineering	70	30	0	100	3	3
115	CEP	630	Advanced Highway Planning and Feasibility Studies	70	30	0	100	3	3
116	CEP	631	Advanced Highway Geometric Design	70	30	0	100	3	3
117	CEP	632	Advanced Soil and Materials Studies For Road Construction	70	30	0	100	3	3
118	CEP	633	Advanced Hydrological Studies of Highways	70	30	0	100	3	3
119	CEP	634	Advanced Structural Design of Highway Pavements	70	30	0	100	3	3

4- Department of Public Works

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
120	CEP	635	Highway Management Systems	70	30	0	100	3	3
121	CEP	636	Advanced Airport Planning and Design	70	30	0	100	3	3
122	CEP	637	Advanced Highway Construction Technology	70	30	0	100	3	3
123	CEP	638	Advanced Highway Maintenance	70	30	0	100	3	3
124	CEP	639	Advanced Highway Construction Management	70	30	0	100	3	3
125	CEP	640	Rapid Speed Train Technology	70	30	0	100	3	3
126	CEP	641	Advanced Railway Alignment	70	30	0	100	3	3
127	CEP	642	Railway Track Design and Analysis	70	30	0	100	3	3
128	CEP	643	Modern Turnouts Technology	70	30	0	100	3	3
129	CEP	644	Advanced Technology of Railway Signals	70	30	0	100	3	3
130	CEP	645	Modern Methods of Railway Station Planning	70	30	0	100	3	3
131	CEP	646	Modern Methods of Construction, Maintenance and Renewal of Railway Lines	70	30	0	100	3	3
132	CEP	647	Railway Environmental Effects	70	30	0	100	3	3
133	CEP	648	Railway Simulation and Modeling	70	30	0	100	3	3
134	CEP	649	Railway Freight Transport Systems	70	30	0	100	3	3
135	CEP	651	Urban Transportation Planning	70	30	0	100	3	3
136	CEP	652	Advanced Transportation Systems	70	30	0	100	3	3
137	CEP	653	Transportation Networks Equilibrium	70	30	0	100	3	3
138	CEP	654	Transportation Economics	70	30	0	100	3	3
139	CEP	660	Hydraulics of Networks & Plants	70	30	0	100	3	3
140	CEP	661	Chemistry of Water	70	30	0	100	3	3
141	CEP	662	Microbiology of Water	70	30	0	100	3	3
142	CEP	663	Advanced Water Treatment	70	30	0	100	3	3
143	CEP	664	Advanced Domestic Wastewater Treatment	70	30	0	100	3	3
144	CEP	665	Industrial Wastewater Treatment	70	30	0	100	3	3
145	CEP	666	Advanced Studies for Solid Wastes	70	30	0	100	3	3
146	CEP	667	Impact of Pollution on Environment	70	30	0	100	3	3
147	CEP	668	Advanced Sludge Treatment	70	30	0	100	3	3
148	CEP	669	Water Treatment Modeling	70	30	0	100	3	3
149	CEP	670	Wastewater Treatment Modeling	70	30	0	100	3	3
150	CEP	671	Water Supply Systems Modeling	70	30	0	100	3	3
151	CEP	672	Sewerage Systems Modeling	70	30	0	100	3	3
152	CEP	673	Special Topics in Environmental Engineering	70	30	0	100	3	3
153	CEP	674	Networks Operation & Maintenance Programs	70	30	0	100	3	3
154	CEP	675	Sea Water Desalination	70	30	0	100	3	3
155	CEP	676	Reuse Of Treated Wastewater	70	30	0	100	3	3
156	CEP	677	Reuse Of Solid Wastes	70	30	0	100	3	3
157	CEP	678	Sludge Disposal & Reuse	70	30	0	100	3	3
158	CEP	679	Industrial Water Supply	70	30	0	100	3	3
159	CEP	681	Traffic Flow Theory and Engineering Applications	70	30	0	100	3	3
160	CEP	682	Traffic Operations and Control	70	30	0	100	3	3
161	CEP	683	Statistical Applications to Traffic Operations	70	30	0	100	3	3

4- Department of Public Works

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
162	CEP	684	Traffic Studies and Analysis	70	30	0	100	3	3
163	CEP	690	Utilities Networks Planning & Its Economy	70	30	0	100	3	3
164	CEP	691	Engineering Economics	70	30	0	100	3	3
165	CEP	692	Advanced Environmental and Social Studies	70	30	0	100	3	3
166	CEP	693	Railway Economic and Management	70	30	0	100	3	3
167	CEP	P99	Project	70	30	0	100	3	3

5- Department of Architecture Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	ARC	501	Professional Practice	60	40	0	100	3	3
02	ARC	502	Report Writing	60	40	0	100	3	3
03	ARC	503	Human Sciences	60	40	0	100	3	3
04	ARC	504	Computer Applications	60	40	0	100	3	3
05	ARC	506	The Project	60	40	0	100	3	3
06	ARC	521	Environmental Design and Energy Conservation	60	40	0	100	3	3
07	ARC	522	Lighting in Buildings	60	40	0	100	3	3
08	ARC	523	Thermal Environment in Buildings	60	40	0	100	3	3
09	ARC	524	Building Acoustics	60	40	0	100	3	3
10	ARC	525	Economic Energy Techniques in Buildings	60	40	0	100	3	3
11	ARC	527	Infrastructure Works	60	40	0	100	3	3
12	ARC	531	Tendering Procedure and Cost Analysis	60	40	0	100	3	3
13	ARC	532	Project Construction Programs	60	40	0	100	3	3
14	ARC	533	Principles and Basics of Handing Over Constructed Work	60	40	0	100	3	3
15	ARC	534	Operation and Maintenance of Building Facilities	60	40	0	100	3	3
16	ARC	535	Evaluation of Projects after Occupancy	60	40	0	100	3	3
17	ARC	541	Urban Sociology	60	40	0	100	3	3
18	ARC	542	Urban Upgrading	60	40	0	100	3	3
19	ARC	543	Housing Studies	60	40	0	100	3	3
20	ARC	544	Low Income Housing	60	40	0	100	3	3
21	ARC	545	Post Occupancy Evaluation of Housing Projects	60	40	0	100	3	3
22	ARC	601	Principles of Scientific Writing	60	40	0	100	3	3
23	ARC	603	Scientific Methodology	60	40	0	100	3	3
24	ARC	605	Humanities in Architecture	60	40	0	100	3	3
25	ARC	611	Studies in Criticism	60	40	0	100	3	3
26	ARC	612	Historicism in Architecture	60	40	0	100	3	3
27	ARC	613	Contemporary Architectural Thought	60	40	0	100	3	3
28	ARC	614	Philosophical Investigations in Architecture	60	40	0	100	3	3
29	ARC	615	Architectural Criticism	60	40	0	100	3	3
30	ARC	616	Architecture and Art	60	40	0	100	3	3
31	ARC	618	Architectural Program	60	40	0	100	3	3
32	ARC	621	The Arab Contemporary Architecture	60	40	0	100	3	3
33	ARC	631	Environmental Control	60	40	0	100	3	3
34	ARC	632	Fundamentals of Energy Conservation	60	40	0	100	3	3
35	ARC	633	Environmental Impacts of Projects	60	40	0	100	3	3
36	ARC	634	Advanced Technical Installations	60	40	0	100	3	3
37	ARC	635	Architectural Restoration	60	40	0	100	3	3
38	ARC	641	Feasibility Studies of Architectural Projects	60	40	0	100	3	3
39	ARC	642	Management of Architectural Projects	60	40	0	100	3	3
40	ARC	643	Performance Evaluation and Maintenance of Buildings	60	40	0	100	3	3
41	ARC	644	Value Engineering	60	40	0	100	3	3

5- Department of Architecture Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
42	ARC	651	Physical & Urban Upgrading	60	40	0	100	3	3
43	ARC	652	Upgrading of Historical Sites	60	40	0	100	3	3
44	ARC	653	Community Participation	60	40	0	100	3	3
45	ARC	654	Housing Policies & Strategies	60	40	0	100	3	3
46	ARC	655	Housing in Developing Countries	60	40	0	100	3	3
47	ARC	656	Seminar 1	60	40	0	100	3	3
48	ARC	657	Seminar 2	60	40	0	100	3	3

6- Department of Urban Planning

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	UPL	501	Management of Urban Development	60	40	0	100	3	3
02	UPL	502	Introduction to Urban Planning	60	40	0	100	3	3
03	UPL	503	Planning of Residential Areas	60	40	0	100	3	3
04	UPL	504	Squatter Areas in Third World Countries	60	40	0	100	3	3
05	UPL	505	Remote Sensing Applications in Urban Planning	60	40	0	100	3	3
06	UPL	506	Planning of Infrastructure Networks	60	40	0	100	3	3
07	UPL	507	Field Studies and Analyses	60	40	0	100	3	3
08	UPL	508	Applied Studies	60	40	0	100	3	3
09	UPL	509	Urban Design in New Districts	60	40	0	100	3	3
10	UPL	510	Computer Applications in Urban Planning	60	40	0	100	3	3
11	UPL	511	Introduction to Urban Design	60	40	0	100	3	3
12	UPL	512	Townscape	60	40	0	100	3	3
13	UPL	513	Man and environmental Control	60	40	0	100	3	3
14	UPL	514	Pollution and the Built Environment	60	40	0	100	3	3
15	UPL	515	Introduction to Environmental Sciences	60	40	0	100	3	3
16	UPL	601	Urban Planning: Theory and Practice	60	40	0	100	3	3
17	UPL	602	Advanced Spatial Analysis	60	40	0	100	3	3
18	UPL	603	Quantitative Analysis	60	40	0	100	3	3
19	UPL	604	Introduction to Economic Theory	60	40	0	100	3	3
20	UPL	605	Contemporary Theories of Urban Design	60	40	0	100	3	3
21	UPL	606	Eco-Urban Design	60	40	0	100	3	3
22	UPL	607	Urban Conservation	60	40	0	100	3	3
23	UPL	608	Environmental Impact Assessment	60	40	0	100	3	3
24	UPL	609	Management of Urban Environment	60	40	0	100	3	3
25	UPL	610	Sustainable Urban Development	60	40	0	100	3	3
26	UPL	611	Urban Upgrading of Informal Areas	60	40	0	100	3	3
27	UPL	612	City Vision and Strategic Planning	60	40	0	100	3	3
28	UPL	613	Construction and Tender Documents	60	40	0	100	3	3
29	UPL	614	Housing Studies	60	40	0	100	3	3
30	UPL	615	Feasibility Studies	60	40	0	100	3	3
31	UPL	616	Project Management	60	40	0	100	3	3
32	UPL	617	Cities in the Age of Globalization	60	40	0	100	3	3
33	UPL	618	Management Strategies for Rural Development	60	40	0	100	3	3
34	UPL	619	Regional Planning	60	40	0	100	3	3
35	UPL	620	Contemporary Trends in Urban Planning	60	40	0	100	3	3
36	UPL	621	Urban Governance	60	40	0	100	3	3
37	UPL	622	Location Theory	60	40	0	100	3	3
38	UPL	623	Participatory Planning	60	40	0	100	3	3
39	UPL	624	Urban Planning in Third World Countries	60	40	0	100	3	3
40	UPL	625	Environment and Human Behavior	60	40	0	100	3	3
41	UPL	626	Eco-Tourism	60	40	0	100	3	3
42	UPL	627	Management of Heritage Sites	60	40	0	100	3	3

6- Department of Urban Planning

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
43	UPL	628	Hillside Development	60	40	0	100	3	3
44	UPL	629	Waterfront Development	60	40	0	100	3	3
45	UPL	630	Marketing for Urban Development	60	40	0	100	3	3
46	UPL	631	New Urban Communities	60	40	0	100	3	3
47	UPL	632	Strategic Environmental Assessment	60	40	0	100	3	3
48	UPL	633	Political Ecology	60	40	0	100	3	3
49	UPL	634	Modeling and Simulation	60	40	0	100	3	3
50	UPL	635	Green Communities	60	40	0	100	3	3
51	UPL	636	Environmental Risk Assessment	60	40	0	100	3	3
52	UPL	637	Mechanisms of Environmental Management	60	40	0	100	3	3
53	UPL	638	Environmental Impact Identification: Methods and Tools	60	40	0	100	3	3
54	UPL	639	Environmental Mapping and Planning	60	40	0	100	3	3
55	UPL	640	Environmental Auditing	60	40	0	100	3	3
56	UPL	641	Social Dimension of EIA	60	40	0	100	3	3
57	UPL	642	Energy Conservation and the Built environment	60	40	0	100	3	3
58	UPL	643	Environmental Impact Assessment Applications	60	40	0	100	3	3
59	UPL	644	Research Methodology	60	40	0	100	3	3

7- Department of Electrical Power & Machines Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	EPM	511	Theories of Electrical Machines	70	30	0	100	3	3
02	EPM	512	Special Electrical Machines	70	30	0	100	3	3
03	EPM	513	Transients in Electrical Machines	70	30	0	100	3	3
04	EPM	514	Control of Electrical Machines	70	30	0	100	3	3
05	EPM	515	Electrical Machine Design (1)	70	30	0	100	3	3
06	EPM	516	Fractional Horsepower Motors	70	30	0	100	3	3
07	EPM	521	Electrical Power System Analysis (Transient cases)	70	30	0	100	3	3
08	EPM	522	Electrical Power Systems Planning	70	30	0	100	3	3
09	EPM	523	Electrical Power System Control and Dynamics	70	30	0	100	3	3
10	EPM	524	Management and Operation of Electric Power Systems	70	30	0	100	3	3
11	EPM	525	Electrical Networks (1)	70	30	0	100	3	3
12	EPM	526	Protection of Electrical Power Systems	70	30	0	100	3	3
13	EPM	531	Switchgear Engineering in Electrical Power Systems	70	30	0	100	3	3
14	EPM	532	High Voltage Engineering	70	30	0	100	3	3
15	EPM	533	DC Transmission of Electrical Energy	70	30	0	100	3	3
16	EPM	534	Electrical Equipment in Power Plants	70	30	0	100	3	3
17	EPM	535	Computational Methods in Power System Analysis	70	30	0	100	3	3
18	EPM	541	Energy Conversion by Semiconductor Devices	70	30	0	100	3	3
19	EPM	542	Power Electronics Systems	70	30	0	100	3	3
20	EPM	543	Electronic Devices for Electric Traction Systems	70	30	0	100	3	3
21	EPM	544	Electric Traction Technologies	70	30	0	100	3	3
22	EPM	545	Electric Drives	70	30	0	100	3	3
23	EPM	546	Harmonic Analysis of Electric Traction Motors	70	30	0	100	3	3
24	EPM	547	Control of DC Machines	70	30	0	100	3	3
25	EPM	548	Control of AC Machines	70	30	0	100	3	3
26	EPM	549	Control of Electric Motors Using Logic Circuits	70	30	0	100	3	3
27	EPM	551	Digital Control of Electric Machines	70	30	0	100	3	3
28	EPM	552	Digital Control of Electric Power Systems	70	30	0	100	3	3
29	EPM	553	Microprocessor Applications in Electric Power and Machines (1)	70	30	0	100	3	3
30	EPM	554	Artificial Intelligence Applications in Electric Power Systems	70	30	0	100	3	3
31	EPM	555	Generation of Electric Energy from Renewable Resources (1)	70	30	0	100	3	3
32	EPM	571	Electrical Testing and Measurements (1)	70	30	0	100	3	3
33	EPM	601	Electromagnetics	70	30	0	100	3	3
34	EPM	611	Theories of Electrical Machines	70	30	0	100	3	3
35	EPM	612	Transients in Linear Systems	70	30	0	100	3	3
36	EPM	613	Design of Electrical Machines (2)	70	30	0	100	3	3

7- Department of Electrical Power & Machines Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
37	EPM	614	Control Systems of Electrical Machines	70	30	0	100	3	3
38	EPM	621	Electric Power System Analysis	70	30	0	100	3	3
39	EPM	622	Control of Electric Power Systems	70	30	0	100	3	3
40	EPM	623	Operation of Electric Power Systems	70	30	0	100	3	3
41	EPM	624	Electric Networks (2)	70	30	0	100	3	3
42	EPM	625	Protection of Electrical Power Systems	70	30	0	100	3	3
43	EPM	631	High Voltage and Extra High Voltage Engineering	70	30	0	100	3	3
44	EPM	632	Electric Materials	70	30	0	100	3	3
45	EPM	641	Power Electronics Systems	70	30	0	100	3	3
46	EPM	642	Design of Power Electronics Circuits	70	30	0	100	3	3
47	EPM	651	Generation of Electric Energy from Renewable Resources (2)	70	30	0	100	3	3
48	EPM	652	Microprocessor Applications in Electric Power and Machines (2)	70	30	0	100	3	3
49	EPM	673	Electric Testing and Measurements (2)	70	30	0	100	3	3
50	EPM	681	Selected Topics in Electric Power and Machines	70	30	0	100	3	3
51	EPM	P98	Project (1)	70	30	0	100	3	3
52	EPM	P99	Project (2)	70	30	0	100	3	3

8- Department of Electronics Engineering & Electrical Communications

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	ECE	500	Electrical Materials	70	30	0	100	3	3
02	ECE	501	Electronic Devices	70	30	0	100	3	3
03	ECE	502	Advanced Semiconductors	70	30	0	100	3	3
04	ECE	503	Semiconductors Processing Technology	70	30	0	100	3	3
05	ECE	504	Semiconductor Measurements and Characterization	70	30	0	100	3	3
06	ECE	505	Materials for Photovoltaics	70	30	0	100	3	3
07	ECE	506	Optical Processes in Semiconductors	70	30	0	100	3	3
08	ECE	507	Optical Fibers	70	30	0	100	3	3
09	ECE	508	Nano-Electronics Technology	70	30	0	100	3	3
10	ECE	509	Printed Circuits Materials and Design	70	30	0	100	3	3
11	ECE	510	Integrated Circuits Engineering	70	30	0	100	3	3
12	ECE	511	Computer Aided Circuit Design (1)	70	30	0	100	3	3
13	ECE	512	Integrated Circuits Technology	70	30	0	100	3	3
14	ECE	513	Thin and Thick Film Technology	70	30	0	100	3	3
15	ECE	514	Photovoltaic Systems (1)	70	30	0	100	3	3
16	ECE	515	Economics of Electronic Projects	70	30	0	100	3	3
17	ECE	520	Active Circuits (1)	70	30	0	100	3	3
18	ECE	521	Color TV Technology	70	30	0	100	3	3
19	ECE	522	Advanced TV Technology	70	30	0	100	3	3
20	ECE	523	Analog Artificial Neural Nets	70	30	0	100	3	3
21	ECE	524	Electronic Circuits for Automotive (1)	70	30	0	100	3	3
22	ECE	525	Electronic Circuits for Automotive (2)	70	30	0	100	3	3
23	ECE	530	Advanced Electronic Measurements (1)	70	30	0	100	3	3
24	ECE	531	Communication Electronics (1)	70	30	0	100	3	3
25	ECE	532	Industrial Electronics	70	30	0	100	3	3
26	ECE	533	Biomedical Electronics (1)	70	30	0	100	3	3
27	ECE	534	Microprocessors and Interfacing Circuits (1)	70	30	0	100	3	3
28	ECE	540	Information Theory and Coding	70	30	0	100	3	3
29	ECE	541	Digital Signal Processing Applications (1)	70	30	0	100	3	3
30	ECE	550	Satellite Communication Systems	70	30	0	100	3	3
31	ECE	551	Digital Communication Systems (1)	70	30	0	100	3	3
32	ECE	552	Mobile Communication Systems	70	30	0	100	3	3
33	ECE	553	Advanced Electronic Communication Systems	70	30	0	100	3	3
34	ECE	555	Microwave Communication Systems	70	30	0	100	3	3
35	ECE	560	Data Communication	70	30	0	100	3	3
36	ECE	561	Transmission Systems	70	30	0	100	3	3
37	ECE	562	Mathematical Models in Networks	70	30	0	100	3	3
38	ECE	563	Network Planning	70	30	0	100	3	3
39	ECE	564	Local Area Networks	70	30	0	100	3	3
40	ECE	570	Antennas Theory and Measurements	70	30	0	100	3	3
41	ECE	571	Microwave Electronics	70	30	0	100	3	3
42	ECE	572	Planar Microwave Circuits	70	30	0	100	3	3
43	ECE	574	Modeling Techniques for Microwave	70	30	0	100	3	3

8- Department of Electronics Engineering & Electrical Communications

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
			Engineering						
44	ECE	575	Microwaves Circuits	70	30	0	100	3	3
45	ECE	580	Opto-Electronic Engineering (1)	70	30	0	100	3	3
46	ECE	581	Integrated Optics (1)	70	30	0	100	3	3
47	ECE	582	Optical Measurements	70	30	0	100	3	3
48	ECE	583	Quantum Electronics (1)	70	30	0	100	3	3
49	ECE	584	Nonlinear Optical Engineering (1)	70	30	0	100	3	3
50	ECE	590	Optical Wave Guide Engineering (1)	70	30	0	100	3	3
51	ECE	591	Optics Engineering (1)	70	30	0	100	3	3
52	ECE	592	Optical Communication Systems (1)	70	30	0	100	3	3
53	ECE	600	Electronic Materials	70	30	0	100	3	3
54	ECE	601	Modeling & Simulation of Electronic Devices	70	30	0	100	3	3
55	ECE	602	Advanced Field Effect Transistors	70	30	0	100	3	3
56	ECE	603	Thin Film Technology	70	30	0	100	3	3
57	ECE	605	Power Devices and Applications	70	30	0	100	3	3
58	ECE	607	Advanced Photovoltaic Systems	70	30	0	100	3	3
59	ECE	611	Design of Analog IC's	70	30	0	100	3	3
60	ECE	612	Design of Digital IC's	70	30	0	100	3	3
61	ECE	613	VLSI Design	70	30	0	100	3	3
62	ECE	614	VLSI Technology	70	30	0	100	3	3
63	ECE	615	Design of Analog Integrated systems	70	30	0	100	3	3
64	ECE	617	Computer Aided Circuit Design (2)	70	30	0	100	3	3
65	ECE	620	Active Circuits (2)	70	30	0	100	3	3
66	ECE	621	Advanced Electronic Circuits	70	30	0	100	3	3
67	ECE	622	Colour TV Systems and Technology	70	30	0	100	3	3
68	ECE	623	Microprocessor and Interfacing Circuits (2)	70	30	0	100	3	3
69	ECE	631	Communication Electronics (2)	70	30	0	100	3	3
70	ECE	632	Selected Topics in Electronic Engineering	70	30	0	100	3	3
71	ECE	633	Biomedical Electronics (2)	70	30	0	100	3	3
72	ECE	641	Digital Signal Processing Applications (2)	70	30	0	100	3	3
73	ECE	650	Digital Communication Systems (2)	70	30	0	100	3	3
74	ECE	651	Radar Systems	70	30	0	100	3	3
75	ECE	653	Satellite Communications Technology	70	30	0	100	3	3
76	ECE	659	Selected Topics in Microwave Engineering	70	30	0	100	3	3
77	ECE	660	Data Networks	70	30	0	100	3	3
78	ECE	670	Mobile Antennas	70	30	0	100	3	3
79	ECE	671	Advanced Microwave Electronics	70	30	0	100	3	3
80	ECE	672	Active Microwave Circuits	70	30	0	100	3	3
81	ECE	673	Electromagnetic Waves	70	30	0	100	3	3
82	ECE	674	Microwave Semiconductor devices	70	30	0	100	3	3
83	ECE	675	Advanced Passive Microwave Circuits	70	30	0	100	3	3
84	ECE	676	Terrestrial Microwave Communication Systems	70	30	0	100	3	3
85	ECE	677	Analysis and Modeling Techniques for Electromagnetic Waves	70	30	0	100	3	3

8- Department of Electronics Engineering & Electrical Communications

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
86	ECE	678	Antenna Theory and Design	70	30	0	100	3	3
87	ECE	680	Opto-electronic Engineering (2)	70	30	0	100	3	3
88	ECE	681	Integrated Optics (2)	70	30	0	100	3	3
89	ECE	683	Quantum Electronics (2)	70	30	0	100	3	3
90	ECE	684	Nonlinear Optical Engineering (2)	70	30	0	100	3	3
91	ECE	685	Integrated Optics Technology	70	30	0	100	3	3
92	ECE	686	Theoretical Basics of Optical Waves	70	30	0	100	3	3
93	ECE	689	Selected Topics in Opto-Electronics	70	30	0	100	3	3
94	ECE	690	Optical Wave-Guide Engineering (2)	70	30	0	100	3	3
95	ECE	691	Optics Engineering (2)	70	30	0	100	3	3
96	ECE	692	Optical Communication Systems (2)	70	30	0	100	3	3
97	ECE	693	Simulation Techniques in Optical Communication	70	30	0	100	3	3
98	ECE	695	Theoretical Basis of Optical Engineering (2)	70	30	0	100	3	3
99	ECE	P97	Project	70	30	0	100	3	3
100	ECE	P98	Project (1)	70	30	0	100	3	3
101	ECE	P99	Project (2)	70	30	0	100	3	3

9- Department of Computer Engineering & System

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	CSE	501	Systems Engineering	70	30	0	100	3	3
02	CSE	502	Control Systems (1)	70	30	0	100	3	3
03	CSE	504	Industrial Process Dynamics	70	30	0	100	3	3
04	CSE	505	Measurement Systems	70	30	0	100	3	3
05	CSE	510	Selected Topics in Control and Systems Engineering	70	30	0	100	3	3
06	CSE	511	Signal Processing	70	30	0	100	3	3
07	CSE	512	Control Systems (2)	70	30	0	100	3	3
08	CSE	514	Computer Applications in Control	70	30	0	100	3	3
09	CSE	515	Computer Controlled Systems	70	30	0	100	3	3
10	CSE	520	Digital Control	70	30	0	100	3	3
11	CSE	521	Industrial Process Control	70	30	0	100	3	3
12	CSE	522	Distributed Control Systems	70	30	0	100	3	3
13	CSE	523	Robot Systems	70	30	0	100	3	3
14	CSE	524	Systems Modeling and Simulation	70	30	0	100	3	3
15	CSE	525	Real-Time Industrial Systems	70	30	0	100	3	3
16	CSE	526	Microprocessor Industrial Applications	70	30	0	100	3	3
17	CSE	527	Advanced Control Systems	70	30	0	100	3	3
18	CSE	528	PC-Based Laboratory Automation	70	30	0	100	3	3
19	CSE	530	Software Engineering	70	30	0	100	3	3
20	CSE	531	Introduction to Artificial Intelligence	70	30	0	100	3	3
21	CSE	532	Data Structures and Algorithms	70	30	0	100	3	3
22	CSE	533	Operating Systems	70	30	0	100	3	3
23	CSE	536	Multimedia Systems	70	30	0	100	3	3
24	CSE	537	Programming Languages	70	30	0	100	3	3
25	CSE	538	Systems Analysis and Design	70	30	0	100	3	3
26	CSE	539	Information Systems	70	30	0	100	3	3
27	CSE	540	Advanced Software Engineering	70	30	0	100	3	3
28	CSE	542	Computer Networks (1)	70	30	0	100	3	3
29	CSE	543	Computer Networks (2)	70	30	0	100	3	3
30	CSE	544	Network Applications	70	30	0	100	3	3
31	CSE	545	Computer Network Management & Security	70	30	0	100	3	3
32	CSE	546	Multimedia Networks	70	30	0	100	3	3
33	CSE	548	Design of Compilers	70	30	0	100	3	3
34	CSE	549	Selected Topics in Computer Engineering	70	30	0	100	3	3
35	CSE	550	Computer Interfacing and Peripherals	70	30	0	100	3	3
36	CSE	551	Knowledge Engineering	70	30	0	100	3	3
37	CSE	553	Database Systems	70	30	0	100	3	3
38	CSE	554	Computer Graphics	70	30	0	100	3	3
39	CSE	555	Microprocessor Systems	70	30	0	100	3	3
40	CSE	556	Computer Architecture	70	30	0	100	3	3
41	CSE	558	Local Area Networks	70	30	0	100	3	3
42	CSE	600	Theoretical Foundation of Computer and Systems Engineering	70	30	0	100	3	3
43	CSE	601	Modeling and Simulation	70	30	0	100	3	3

9- Department of Computer Engineering & System

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
44	CSE	602	Artificial Intelligence	70	30	0	100	3	3
45	CSE	610	Systems Modeling and Identification	70	30	0	100	3	3
46	CSE	611	Real-Time Computer Control	70	30	0	100	3	3
47	CSE	612	Stochastic Process Control	70	30	0	100	3	3
48	CSE	613	Microprocessor-Based Systems	70	30	0	100	3	3
49	CSE	614	Robots and Manipulators	70	30	0	100	3	3
50	CSE	615	Intelligent Control Systems	70	30	0	100	3	3
51	CSE	616	Neural Networks and Their Applications	70	30	0	100	3	3
52	CSE	617	Digital Image Processing	70	30	0	100	3	3
53	CSE	618	Pattern Recognition	70	30	0	100	3	3
54	CSE	619	Selected Topics in Control and Systems Engineering	70	30	0	100	3	3
55	CSE	620	Advanced Computer Architecture	70	30	0	100	3	3
56	CSE	621	Expert Systems	70	30	0	100	3	3
57	CSE	622	Advanced Computer Networks	70	30	0	100	3	3
58	CSE	623	Computer Graphics and Visualization	70	30	0	100	3	3
59	CSE	624	Distributed Database Systems	70	30	0	100	3	3
60	CSE	625	Distributed Operating Systems	70	30	0	100	3	3
61	CSE	626	Natural Language Understanding	70	30	0	100	3	3
62	CSE	627	Computer and Network Security	70	30	0	100	3	3
63	CSE	628	Computer Network Management	70	30	0	100	3	3
64	CSE	629	Selected Topics in Computer Engineering	70	30	0	100	3	3
65	CSE	630	Virtual Reality	70	30	0	100	3	3
66	CSE	631	Distributed Multimedia Systems	70	30	0	100	3	3
67	CSE	632	Advanced Programming Languages	70	30	0	100	3	3
68	CSE	633	Quantum Computation and Communication	70	30	0	100	3	3
69	CSE	634	Digital Video Processing	70	30	0	100	3	3
70	CSE	635	Advanced Operating Systems	70	30	0	100	3	3
71	CSE	638	Biometrics	70	30	0	100	3	3
72	CSE	639	Computational Biology	70	30	0	100	3	3
73	CSE	640	Digital VLSI Systems	70	30	0	100	3	3
74	CSE	641	Digital Systems Testing	70	30	0	100	3	3
75	CSE	642	CAD for Digital Circuits	70	30	0	100	3	3
76	CSE	643	Embedded Computer Systems	70	30	0	100	3	3
77	CSE	644	Parallel Computer Systems	70	30	0	100	3	3
78	CSE	645	Cluster Computer Systems	70	30	0	100	3	3
79	CSE	P98	Project (1)	70	30	0	100	3	3
80	CSE	P99	Project (2)	70	30	0	100	3	3

10- Department of Design and Production Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	MDP	500	Noise Control	70	30	0	100	3	3
02	MDP	501	Theory of Machines	70	30	0	100	3	3
03	MDP	505	Statistical Quality Control (1)	70	30	0	100	3	3
04	MDP	511	Bulk Materials - Experimental Techniques	70	30	0	100	3	3
05	MDP	512	Advanced Ceramic Materials	70	30	0	100	3	3
06	MDP	513	Polymer Materials	70	30	0	100	3	3
07	MDP	514	Failure Analysis of Mechanical Components	70	30	0	100	3	3
08	MDP	515	Materials Characterization	70	30	0	100	3	3
09	MDP	516	Engineering Metallurgy	70	30	0	100	3	3
10	MDP	517	Materials and Process Selection	70	30	0	100	3	3
11	MDP	518	Modeling and Simulation of Materials	70	30	0	100	3	3
12	MDP	519	Light Alloys	70	30	0	100	3	3
13	MDP	520	Casting Processes	70	30	0	100	3	3
14	MDP	521	Polymer Processing	70	30	0	100	3	3
15	MDP	522	Powder Metallurgy	70	30	0	100	3	3
16	MDP	523	Thermodynamics of Materials	70	30	0	100	3	3
17	MDP	524	Joining and Welding Processes	70	30	0	100	3	3
18	MDP	525	Mechanical Behavior of Materials	70	30	0	100	3	3
19	MDP	526	Introduction to Nanomaterials	70	30	0	100	3	3
20	MDP	527	Materials and Technologies for Repair of Engineering Components	70	30	0	100	3	3
21	MDP	528	Optimization of Life Cycle Cost	70	30	0	100	3	3
22	MDP	530	Computer Aided Mechanical Design	70	30	0	100	3	3
23	MDP	531	Theoretical Basis for Design	70	30	0	100	3	3
24	MDP	532	Practical Basis for Design	70	30	0	100	3	3
25	MDP	534	Advanced Stress Analysis	70	30	0	100	3	3
26	MDP	535	Reversed Engineering	70	30	0	100	3	3
27	MDP	540	Production Process Control Technology	70	30	0	100	3	3
28	MDP	541	Digital Control (1)	70	30	0	100	3	3
29	MDP	542	Robotics	70	30	0	100	3	3
30	MDP	543	Mechatronics (1)	70	30	0	100	3	3
31	MDP	544	Pneumatic and Hydraulic Control (1)	70	30	0	100	3	3
32	MDP	545	Servo Mechanisms	70	30	0	100	3	3
33	MDP	546	Automation of Production Lines	70	30	0	100	3	3
34	MDP	547	Automatic Control of Mechanical Equipment	70	30	0	100	3	3
35	MDP	550	Metal Forming Processes	70	30	0	100	3	3
36	MDP	551	Metal Forming Machines	70	30	0	100	3	3
37	MDP	552	Metal Forming Tools and Accessories (1)	70	30	0	100	3	3
38	MDP	553	Non Conventional Metal Forming Processes	70	30	0	100	3	3
39	MDP	554	Metal Forming Dies	70	30	0	100	3	3
40	MDP	555	Theory of Metal Forming	70	30	0	100	3	3
41	MDP	556	Product Design & Development	70	30	0	100	3	3
42	MDP	557	Industrial Innovation	70	30	0	100	3	3
43	MDP	560	Numerically Controlled Machine Tools (1)	70	30	0	100	3	3
44	MDP	561	Non-Conventional Machining Processes	70	30	0	100	3	3

10- Department of Design and Production Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
45	MDP	562	Cutting Tool Design	70	30	0	100	3	3
46	MDP	563	Hydraulic and Pneumatic Equipment for Machine Tools	70	30	0	100	3	3
47	MDP	564	Computer Aided Manufacturing	70	30	0	100	3	3
48	MDP	565	Jigs and Fixtures	70	30	0	100	3	3
49	MDP	566	Theory of Metal Cutting (1)	70	30	0	100	3	3
50	MDP	567	Machining Processes (1)	70	30	0	100	3	3
51	MDP	568	Machine Tools (1)	70	30	0	100	3	3
52	MDP	571	Sensors and Transducers (1)	70	30	0	100	3	3
53	MDP	572	Measuring Equipment	70	30	0	100	3	3
54	MDP	573	Dimensional Metrology	70	30	0	100	3	3
55	MDP	574	Physical Quantity Measurements (1)	70	30	0	100	3	3
56	MDP	575	Information Theory	70	30	0	100	3	3
57	MDP	576	Data Acquisition Systems	70	30	0	100	3	3
58	MDP	578	Advanced Techniques in Measurements (1)	70	30	0	100	3	3
59	MDP	580	Industrial Organization	70	30	0	100	3	3
60	MDP	581	Facility Planning and Design	70	30	0	100	3	3
61	MDP	582	Work Study	70	30	0	100	3	3
62	MDP	583	Basics of Industrial Engineering	70	30	0	100	3	3
63	MDP	584	Operations Research	70	30	0	100	3	3
64	MDP	585	Production Planning and Control (1)	70	30	0	100	3	3
65	MDP	586	Engineering Economics	70	30	0	100	3	3
66	MDP	587	Quantitative Approaches to Management	70	30	0	100	3	3
67	MDP	588	Maintenance Management	70	30	0	100	3	3
68	MDP	589	Marketing	70	30	0	100	3	3
69	MDP	590	Process Quality Control	70	30	0	100	3	3
70	MDP	591	Sampling Inspection	70	30	0	100	3	3
71	MDP	592	Control Charts	70	30	0	100	3	3
72	MDP	593	Industrial Statistics (1)	70	30	0	100	3	3
73	MDP	594	Environmental Quality Characteristics	70	30	0	100	3	3
74	MDP	595	Legislation and Standardization for Quality	70	30	0	100	3	3
75	MDP	596	Total Quality Control	70	30	0	100	3	3
76	MDP	597	Environmental Quality Assessment	70	30	0	100	3	3
77	MDP	598	Quality Systems	70	30	0	100	3	3
78	MDP	599	Design of Experiments (1)	70	30	0	100	3	3
79	MDP	600	Mechanical Vibrations (1)	70	30	0	100	3	3
80	MDP	601	Selected Topics in Quality	70	30	0	100	3	3
81	MDP	602	Mechanisms	70	30	0	100	3	3
82	MDP	604	Advanced Acoustics	70	30	0	100	3	3
83	MDP	605	Noise and Vibration Control	70	30	0	100	3	3
84	MDP	606	Advanced Manufacturing Technology	70	30	0	100	3	3
85	MDP	607	Advanced Machine Design	70	30	0	100	3	3
86	MDP	610	Advanced Metallurgy	70	30	0	100	3	3
87	MDP	611	Mechanical Metallurgy	70	30	0	100	3	3
88	MDP	612	Metallurgical Processes	70	30	0	100	3	3

10- Department of Design and Production Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
89	MDP	613	Composites and Advanced Materials	70	30	0	100	3	3
90	MDP	614	Materials Engineering of Polymers	70	30	0	100	3	3
91	MDP	620	Fundamentals of Solidification	70	30	0	100	3	3
92	MDP	621	Structure and Properties	70	30	0	100	3	3
93	MDP	622	Simulation of Casting and Welding	70	30	0	100	3	3
94	MDP	640	Modern Control Systems	70	30	0	100	3	3
95	MDP	641	Optimum Control	70	30	0	100	3	3
96	MDP	642	System Identification	70	30	0	100	3	3
97	MDP	643	Advanced Techniques in Automatic Control	70	30	0	100	3	3
98	MDP	644	Digital Control (2)	70	30	0	100	3	3
99	MDP	645	Mechatronics (2)	70	30	0	100	3	3
100	MDP	646	Adaptive Control	70	30	0	100	3	3
101	MDP	647	Pneumatic and Hydraulic Control (2)	70	30	0	100	3	3
102	MDP	650	Metal Forming Tools and Accessories (2)	70	30	0	100	3	3
103	MDP	651	Simulation of Metal Forming Processes	70	30	0	100	3	3
104	MDP	652	Theory of Plasticity	70	30	0	100	3	3
105	MDP	653	Mathematical Modeling of Metal Forming Processes	70	30	0	100	3	3
106	MDP	654	Advanced Metal Forming	70	30	0	100	3	3
107	MDP	657	Computer Applications in Industry	70	30	0	100	3	3
108	MDP	658	Computer Aided Process Planning	70	30	0	100	3	3
109	MDP	659	Design for X	70	30	0	100	3	3
110	MDP	660	CNC Machine Tools (2)	70	30	0	100	3	3
111	MDP	661	Flexible Production Systems	70	30	0	100	3	3
112	MDP	662	Advanced Programming Methods of CNC Machine Tools	70	30	0	100	3	3
113	MDP	664	Theory of Metal Cutting (2)	70	30	0	100	3	3
114	MDP	665	Manual CNC Part Programming	70	30	0	100	3	3
115	MDP	666	Machine Tools (2)	70	30	0	100	3	3
116	MDP	669	Intelligent Visual Inspection	70	30	0	100	3	3
117	MDP	670	Theory of Measurement	70	30	0	100	3	3
118	MDP	671	Sensors and Transducers (2)	70	30	0	100	3	3
119	MDP	672	Geometrical Error Measurement	70	30	0	100	3	3
120	MDP	674	Physical Quantity Measurements (2)	70	30	0	100	3	3
121	MDP	675	Advanced Techniques in Measurements (2)	70	30	0	100	3	3
122	MDP	676	Calibration	70	30	0	100	3	3
123	MDP	677	Computer Applications in Measurements	70	30	0	100	3	3
124	MDP	678	Machine Tools Acceptance Tests	70	30	0	100	3	3
125	MDP	680	Product Safety Management and Engineering (2)	70	30	0	100	3	3
126	MDP	681	Production Planning and Control (2)	70	30	0	100	3	3
127	MDP	682	Materials Management	70	30	0	100	3	3
128	MDP	683	Simulation Modeling	70	30	0	100	3	3
129	MDP	684	Modeling and Optimization	70	30	0	100	3	3
130	MDP	685	Human Factors Engineering "Ergonomics"	70	30	0	100	3	3
131	MDP	686	Production and Environment	70	30	0	100	3	3

10- Department of Design and Production Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
132	MDP	690	Design of Experiments (2)	70	30	0	100	3	3
133	MDP	691	Reliability Engineering	70	30	0	100	3	3
134	MDP	692	Quality Engineering	70	30	0	100	3	3
135	MDP	693	Quality Control of Service Industries	70	30	0	100	3	3
136	MDP	694	Industrial Statistics (2)	70	30	0	100	3	3
137	MDP	695	Statistical Quality Control (2)	70	30	0	100	3	3
138	MDP	696	Quality Information Systems	70	30	0	100	3	3
139	MDP	697	Personnel Management	70	30	0	100	3	3
140	MDP	698	Consumer Behavior Analysis	70	30	0	100	3	3
141	MDP	699	Total Quality Management	70	30	0	100	3	3
142	MDP	P97	Project	70	30	0	100	3	3
143	MDP	P98	Project (1)	70	30	0	100	3	3
144	MDP	P99	Project (2)	70	30	0	100	3	3
145	MDP	615	Polymer Processing and Recycling	70	30	0	100	3	3
146	MDP	616	Principles of Materials Thermodynamics	70	30	0	100	3	3
147	MDP	617	Methods and Techniques of Materials Characterization	70	30	0	100	3	3
148	MDP	618	Fundamentals of Nanomaterials	70	30	0	100	3	3
149	MDP	619	Bulk Nano Materials Properties and Chrecterization	70	30	0	100	3	3
150	MDP	623	Mechanical Behavior of Materials	70	30	0	100	3	3
151	MDP	624	Modeling and Simulation of Materials	70	30	0	100	3	3
152	MDP	625	Light Metallic Alloys	70	30	0	100	3	3
153	MDP	626	Ceramic Materials Properties and Processing	70	30	0	100	3	3
154	MDP	627	Powder Metallurgy	70	30	0	100	3	3
155	MDP	628	Materials Selection,Design and Relationship with Environment	70	30	0	100	3	3
156	MDP	687	Optimization of Life Cycle Cost	70	30	0	100	3	3

11- Department of Mechanical Power Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	MEP	500	Transient Combustion	70	30	0	100	3	3
02	MEP	501	Combustion	70	30	0	100	3	3
03	MEP	502	Combustion Equipment for Boilers	70	30	0	100	3	3
04	MEP	504	Industrial Furnaces and Boilers	70	30	0	100	3	3
05	MEP	506	Steam Equipment and Piping	70	30	0	100	3	3
06	MEP	509	Computer Applications in Furnaces and Boilers	70	30	0	100	3	3
07	MEP	510	Pump Design (1)	70	30	0	100	3	3
08	MEP	511	Pipe Networks and Reservoirs	70	30	0	100	3	3
09	MEP	512	Operation, Maintenance and Testing of Pumps	70	30	0	100	3	3
10	MEP	513	Pump Selection	70	30	0	100	3	3
11	MEP	515	Pumping Stations	70	30	0	100	3	3
12	MEP	516	Pump Design (2)	70	30	0	100	3	3
13	MEP	517	Corrosion Engineering	70	30	0	100	3	3
14	MEP	518	Pumping Services	70	30	0	100	3	3
15	MEP	519	Computer Applications in Pumping	70	30	0	100	3	3
16	MEP	520	Performance of Industrial Thermal Units	70	30	0	100	3	3
17	MEP	521	Aerodynamics (1)	70	30	0	100	3	3
18	MEP	522	Gas Dynamics (1)	70	30	0	100	3	3
19	MEP	523	Water Turbines	70	30	0	100	3	3
20	MEP	524	Gas and Steam Turbines	70	30	0	100	3	3
21	MEP	525	Pumps and Compressors	70	30	0	100	3	3
22	MEP	526	Control of Pumps and Turbo-Machines	70	30	0	100	3	3
23	MEP	528	Operation, Maintenance and Testing of Turbo-Machines	70	30	0	100	3	3
24	MEP	529	Fluid Mechanics (1)	70	30	0	100	3	3
25	MEP	530	Heat Transfer (1)	70	30	0	100	3	3
26	MEP	531	Hot and Cold Water Piping Systems	70	30	0	100	3	3
27	MEP	532	Heat Transfer in Industrial Furnaces and Boilers	70	30	0	100	3	3
28	MEP	533	Thermal Drying Processes	70	30	0	100	3	3
29	MEP	534	Preparing Processes	70	30	0	100	3	3
30	MEP	536	Heat Transfer (2)	70	30	0	100	3	3
31	MEP	537	Treatment of Boiler and Industrial Water	70	30	0	100	3	3
32	MEP	539	Refrigeration Cooling Load (1)	70	30	0	100	3	3
33	MEP	540	Refrigeration Cooling Load (2)	70	30	0	100	3	3
34	MEP	541	Testing, Adjusting and Balancing of HVAC Systems	70	30	0	100	3	3
35	MEP	542	Preservation and Freezing Processes	70	30	0	100	3	3
36	MEP	543	Cooling and Freezing Systems	70	30	0	100	3	3
37	MEP	544	Control and Safety Equipment in Refrigeration and Air Condtioning	70	30	0	100	3	3
38	MEP	545	Installation and Maintenance of Refrigeration Systems	70	30	0	100	3	3
39	MEP	546	Refrigeration and Freezing Applications	70	30	0	100	3	3
40	MEP	547	Performance & Economics of Refrigeration	70	30	0	100	3	3

11- Department of Mechanical Power Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
41	MEP	548	Computer Application in Refrigeration	70	30	0	100	3	3
42	MEP	549	Airconditioning Cooling Load (1)	70	30	0	100	3	3
43	MEP	550	Airconditioning Cooling Load (2)	70	30	0	100	3	3
44	MEP	551	Natural and Mechanical Ventilation Systems	70	30	0	100	3	3
45	MEP	552	Air Distribution Systems in Air Conditioning	70	30	0	100	3	3
46	MEP	553	Airconditioning Systems	70	30	0	100	3	3
47	MEP	555	Installation and Maintenance of Air Conditioning Systems	70	30	0	100	3	3
48	MEP	556	Airconditioning and Ventilation Applications	70	30	0	100	3	3
49	MEP	557	Performance and Economics of Airconditioning	70	30	0	100	3	3
50	MEP	558	Computer Applications in Air Conditioning	70	30	0	100	3	3
51	MEP	559	Energy and Environment	70	30	0	100	3	3
52	MEP	560	Solar Energy	70	30	0	100	3	3
53	MEP	561	Wind Energy	70	30	0	100	3	3
54	MEP	562	Practical Applications of Renewable Energy	70	30	0	100	3	3
55	MEP	563	Renewable Energy Sources and Its Environmental Impact	70	30	0	100	3	3
56	MEP	564	Energy Storage	70	30	0	100	3	3
57	MEP	565	Sea Wave Energy	70	30	0	100	3	3
58	MEP	566	Bio-Energy	70	30	0	100	3	3
59	MEP	567	Thermodynamics (2)	70	30	0	100	3	3
60	MEP	568	Control of Industrial Furnaces, Boilers and Industrial Processes	70	30	0	100	3	3
61	MEP	572	Automatic Control in Engines	70	30	0	100	3	3
62	MEP	573	Performance of Internal Combustion Engines	70	30	0	100	3	3
63	MEP	574	Testing and Calibration of Internal Combustion Engines	70	30	0	100	3	3
64	MEP	575	Foundations and Vibrations of Engines	70	30	0	100	3	3
65	MEP	576	Steam Power Stations	70	30	0	100	3	3
66	MEP	577	Gas Turbine and Diesel Engine Power Plants	70	30	0	100	3	3
67	MEP	578	Nuclear Power Stations	70	30	0	100	3	3
68	MEP	579	Control and Safety Instruments in Power Stations	70	30	0	100	3	3
69	MEP	580	Operation and Maintenance of Thermal Power Plants	70	30	0	100	3	3
70	MEP	581	Project Management	70	30	0	100	3	3
71	MEP	600	Combustion Engineering	70	30	0	100	3	3
72	MEP	601	Advanced Thermodynamics	70	30	0	100	3	3
73	MEP	611	Advanced Fluid Dynamics	70	30	0	100	3	3
74	MEP	612	Multi-Phase Flow	70	30	0	100	3	3
75	MEP	613	Water Power Engineering	70	30	0	100	3	3
76	MEP	614	Unsteady Flow of Fluids	70	30	0	100	3	3
77	MEP	616	Jet Propulsion	70	30	0	100	3	3
78	MEP	617	Turbulent Flow	70	30	0	100	3	3

11- Department of Mechanical Power Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
79	MEP	620	Fluid Mechanics (2)	70	30	0	100	3	3
80	MEP	621	Aerodynamics (2)	70	30	0	100	3	3
81	MEP	622	Advanced Trubo-Machines	70	30	0	100	3	3
82	MEP	624	Gas Dynamics (2)	70	30	0	100	3	3
83	MEP	630	Heat Transfer By Conduction	70	30	0	100	3	3
84	MEP	631	Convective Heat and Momentum Transfer	70	30	0	100	3	3
85	MEP	632	Water Desalination	70	30	0	100	3	3
86	MEP	633	Boundary Layer Theory	70	30	0	100	3	3
87	MEP	634	Heat Transfer By Radiation	70	30	0	100	3	3
88	MEP	671	Energy Measurements in Thermal Plants, Boilers and Industrial Furnaces	70	30	0	100	3	3
89	MEP	672	Advanced Measurements	70	30	0	100	3	3
90	MEP	690	Economics of Power Generation	70	30	0	100	3	3
91	MEP	691	Turbulent Jets and Wakes Flows	70	30	0	100	3	3
92	MEP	P99	Project	70	30	0	100	3	3

12- Department of Automotive Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	MEA	510	Fault Finding in Vehicles	70	30	0	100	3	3
02	MEA	511	Technical Specifications and Tenders Evaluation	70	30	0	100	3	3
03	MEA	512	Maintenance Engineering	70	30	0	100	3	3
04	MEA	513	Industrial Safety	70	30	0	100	3	3
05	MEA	514	Total Quality Assurance	70	30	0	100	3	3
06	MEA	515	Service Station Planning	70	30	0	100	3	3
07	MEA	516	Workshop Equipment	70	30	0	100	3	3
08	MEA	517	Fault Diagnosis of Injection Systems	70	30	0	100	3	3
09	MEA	520	Automotive Engineering (1)	70	30	0	100	3	3
10	MEA	521	Automotive Engineering (2)	70	30	0	100	3	3
11	MEA	522	Pneumatic and Hydraulic Systems	70	30	0	100	3	3
12	MEA	523	Air Pollution	70	30	0	100	3	3
13	MEA	524	Vehicle Aerodynamics	70	30	0	100	3	3
14	MEA	525	Braking Systems	70	30	0	100	3	3
15	MEA	530	Vehicles Design (1)	70	30	0	100	3	3
16	MEA	531	Testing and Calibration (1)	70	30	0	100	3	3
17	MEA	532	Testing and Calibration (2)	70	30	0	100	3	3
18	MEA	533	Mechanical Stresses in Fuel Systems	70	30	0	100	3	3
19	MEA	534	Automotive Accident Analysis	70	30	0	100	3	3
20	MEA	535	Reverse Engineering Applications	70	30	0	100	3	3
21	MEA	536	Vehicle Design (2)	70	30	0	100	3	3
22	MEA	537	Finite Elements Applications in Vehicles	70	30	0	100	3	3
23	MEA	540	Fuel Injection Systems (1)	70	30	0	100	3	3
24	MEA	541	Friction, Wear and Lubrication (1)	70	30	0	100	3	3
25	MEA	542	Theory of Fuel injection	70	30	0	100	3	3
26	MEA	543	Fuel Economy	70	30	0	100	3	3
27	MEA	544	Matching of Fuel Injection Systems	70	30	0	100	3	3
28	MEA	550	Hoisting and Handling Equipment	70	30	0	100	3	3
29	MEA	551	Power Generation Equipment	70	30	0	100	3	3
30	MEA	552	Crushing and Mixing Equipment	70	30	0	100	3	3
31	MEA	553	Earth Moving Equipment	70	30	0	100	3	3
32	MEA	554	Loading and Unloading Equipment	70	30	0	100	3	3
33	MEA	560	Vehicle Control	70	30	0	100	3	3
34	MEA	561	Car Electronics (1)	70	30	0	100	3	3
35	MEA	562	Automatic Driving Systems	70	30	0	100	3	3
36	MEA	563	Safety and Traffic Control	70	30	0	100	3	3
37	MEA	564	Automation of Diagnostic Process	70	30	0	100	3	3
38	MEA	570	Transportation Economics	70	30	0	100	3	3
39	MEA	571	Operation Cost Analysis	70	30	0	100	3	3
40	MEA	572	Stores Organization and Management	70	30	0	100	3	3
41	MEA	573	Operational Management and Productivity	70	30	0	100	3	3
42	MEA	580	Air Cushioned Vehicle	70	30	0	100	3	3
43	MEA	590	Design of Composite Materials	70	30	0	100	3	3
44	MEA	591	Composite Materials Fabrication	70	30	0	100	3	3

12- Department of Automotive Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
45	MEA	610	Maintenance Management	70	30	0	100	3	3
46	MEA	611	Maintenance, Replacement and Reliability	70	30	0	100	3	3
47	MEA	620	Theory of Vehicles	70	30	0	100	3	3
48	MEA	621	Pneumatic and Hydraulic Systems	70	30	0	100	3	3
49	MEA	622	Vehicle Dynamics	70	30	0	100	3	3
50	MEA	630	Design of Experiments	70	30	0	100	3	3
51	MEA	631	Measurement Systems	70	30	0	100	3	3
52	MEA	632	Vehicle Design (3)	70	30	0	100	3	3
53	MEA	640	Fuel Alternatives	70	30	0	100	3	3
54	MEA	641	Friction, Wear and Lubrication (2)	70	30	0	100	3	3
55	MEA	642	Fuel Injection Systems (2)	70	30	0	100	3	3
56	MEA	663	Car Electronics (2)	70	30	0	100	3	3
57	MEA	680	Stability of Air Cushioned Vehicle	70	30	0	100	3	3
58	MEA	P98	Project (1)	70	30	0	100	3	3
59	MEA	P99	Project (2)	70	30	0	100	3	3

13- Department of Michatronics Engineering

No	Course Code	Course No.	Course Name	Max Marks				Credit Hours	Exam Hours
				Final	Year Work	Oral/ Lab	Total		
01	MCT	512	Mechatronic Mechanisms	70	30	0	100	3	3
02	MCT	513	Advanced Mechanical Design	70	30	0	100	3	3
03	MCT	514	Industrial Electronics Applications in Mechatronics	70	30	0	100	3	3
04	MCT	515	Precision Actuators	70	30	0	100	3	3
05	MCT	516	Embedded Systems	70	30	0	100	3	3
06	MCT	517	Embedded Systems (1)	70	30	0	100	3	3
07	MCT	518	Modern Automatic Control	70	30	0	100	3	3
08	MCT	519	Nanotechnology Applications in Mechatronics Systems	70	30	0	100	3	3
09	MCT	610	Design of Mechatronic Systems	70	30	0	100	3	3
10	MCT	617	Embedded Systems (2)	70	30	0	100	3	3
11	MCT	618	Selected Topics in Mechatronics Engineering	70	30	0	100	3	3
12	MCT	620	Supervisory Control Design of Discrete Event Systems	70	30	0	100	3	3
13	MCT	621	Motion Control and Servo Systems	70	30	0	100	3	3
14	MCT	622	Mechatronic Systems Modeling and Identification	70	30	0	100	3	3

COURSE SYLLABUSES

1. Department of Engineering Physics and Mathematics

PHM 400 Modern Physics

Special Theory of Relativity, Planck's Hypothesis and The Black Body Radiation, The Photoelectric Effect, The Compton Effect, Atomic Line Spectra and Bohr's Theory for of The Hydrogen-Like Atom, Zeeman and Stark Effects, De Broglie Waves and Schrödinger Equation and Its Applications, Electron Spin and Atomic Structure, Classical and Quantum Statistics, The Fermi-Dirac Distribution Function, Free Electron Theory of Solids, Crystal Structures, Semiconductors.

PHM 401 Quantum Mechanics

Basic Postulates of Quantum Mechanics, Mathematical Foundations of Quantum Mechanics, Potential Wells and Tunnel Effect, The Harmonic Oscillator, Motion in a Central Potential, Time Independent Perturbation Theory, Time Dependent Perturbation Theory, The Interaction of Electromagnetic Radiation with Atomic Systems.

PHM 402 Solid State Physics

The Crystalline State, The Specific Heat of Solids and Lattice Vibrations, The Band Theory of Solids, Free Electron Theory and Conductivity of Metals, The Electron Distribution in Insulators and Semiconductors, p-n Junctions and Transistors, Dielectric and Optical Properties of Insulators, Photoconductivity, Luminescence, Diamagnetism and Paramagnetism.

PHM 403 Statistical Thermodynamics

Complete Review of Definitions and Formulae Used in Statistics, Review of The Kinetic Theory of an Ideal Gas, The Maxwellian Distribution of Molecular Velocities, Boltzmann Statistics and Its Applications, Classical Quantum Statistics, Einstein's Equation and Debye's Theory of The Specific Heat of Solids, Heat Radiation and Planck's Law, The Bose – Einstein Statistics with Application to The Photon Gas, The Fermi – Dirac Statistics with Application, Thermionic Emission.

PHM 404 Semiconductor Physics

Electron Theory of Conductivity, The Fundamentals of The Band Theory of Semiconductors, Electron and Hole Statistics of Semiconductors, The Theory of Charge Carrier Scattering, Change Carrier Recombination, Contact Phenomena in Semiconductors, Optical and Photoelectrical Phenomena in Semiconductors.

PHM 405 Physics of Semiconductor Devices

Review of the Fundamentals of the Electronic Properties of Semiconductors, Contact Phenomena, p-n Junctions, Schottky Diodes, Photo-Diodes, Bipolar and Field Effect Transistors.

PHM 406 Electrodynamics (1)

Electrostatic and Magnetostatic Fields, Guass's Law, Amper's Law, Faraday's Law, Maxwell's Equations in Integral and Differential Forms, Boundary Conditions, Solving

Maxwell's Equations for homogeneous charge-free medium, Scalar and Vector Potentials, Power Density, Poynting's Theorem, Special Theory of Relativity.

PHM 407 Geometrical and Physical Optics

Image Formation, Ray Tracing, Total Internal Reflection, Refraction of Light, Aberrations of Lenses, Image Quality Evaluation, Dispersion Theory, Optical Design, Interference of Light, Diffraction of Light, Polarization of Light.

PHM 408 Physics of Dielectrics

Polarization of Dielectrics, Different Types of Polarizabilities, Different Expressions for The Dielectric Constant, Dependence of Dielectric Constant on Temperature and Frequency, Losses in Dielectrics, Composite Dielectrics.

PHM 409 Atomic Physics(1)

Radiation Theory, Photon – Particle Scattering, Models of Hydrogen Atom, Optical Spectrum of the Atom, Quantum Numbers and Electronic Distribution in the Atom.

PHM 410 Nuclear Physics (1)

Fundamental Properties of the Atomic Nucleus, Different Types of Nuclear Reactions, Detection Methods of Nuclear Particle (Electronic and Visual), Nuclear Accelerators, Production of Radioisotopes and Their Every Day Uses, Simple Quantum Mechanical Examples of Nuclear Sculpturing Treatment, Different Models of Nuclear Structure.

PHM 411 Materials Science

Introductory Principles: Materials and Properties, Structure and Energy of Atoms, Atomic Bonding and Coordination, Structure of Solid Phases: Crystalline Phases, Crystal Geometry, Structure Disorder, Solid Solution, Electrical Processes in Solids, Dielectric Behavior of Materials, Electronic Properties of Solids, Semi-Conduction in Solids, Magnetic Behavior of Solids, Polymers, Ceramics, and Amorphous Materials.

PHM 412 Plasma Physics (1)

Plasma in Nature and in Laboratory Systems, Statistics of Weakly Ionized Gas, The Ideal Plasma, Elementary Processes in Plasma, Formation and Decomposition of Charged Particles in Weakly Ionized Gas, Physical Kinetics of Gas and Plasma.

PHM 413 Computational Physics

Monte-Carlo Sampling Method and Modeling, Approximate Models of Random Fields, Solving Boundary Value Problems by the Monte-Carlo Method, Stochastic Processes and Markovian Chains, Eigenvalues of a Sparse Matrix and the Monte-Carlo Technique.

PHM 440 Linear Algebra (1)

Vector Spaces, Matrices and Determinants, Linear Transformations, Sets of Linear Equations, Convex Sets and N-Dimensional Geometry, Characteristic Value Problems and Quadratic Forms.

PHM 441 Abstract Algebra (1)

Binary Operations, Groups, Subgroups, Homomorphisms, Cosets, Lagrange's Theorem, Permutation Groups, The General Linear Group, Rings, Polynomial Rings, Euclidean Rings.

PHM 442 Real Analysis (1)

Sets and Functions Including: Equivalence – Countability and Least Upper Bounds, Sequences of Real Numbers Including: Operations on Convergent Sequences – Limits Superior and Inferior and Cauchy Sequences, Series of Real Numbers Including Class l^2, Metric Spaces and Limits in It, Continuous Functions on Metric Spaces: Continuity on a Real Line and on a Metric Space – Open and Closed Sets and the Distance From a Point to a Set.

PHM 443 Functions of Complex Variable (1)

Basic Concepts, Analytic Functions, Infinite Series, Integral Theorems, Calculus of Residues, Conformal Mappings and Applications.

PHM 444 Ordinary Differential Equations (1)

First-Order Differential Equations, General Theory of Linear Differential Equations, Systems of Linear Equations.

PHM 445 Partial Differential Equations (1)

Basic Concepts, Classification of Second-Order Linear Equations, Cauchy Problem for Wave Equation and Its Solution, Fourier Series, Separation of Variables for Equations of Mathematical Physics.

PHM 446 Numerical Analysis (1)

Theoretical and Analytical Study of Iterative Methods in Matrix Algebra, Eigenvalues, Nonlinear Equations, Numerical Differentiation and Integration, Initial-Value Problems for Ordinary Differential Equations, Boundary Value Problems for Ordinary Differential Equations, Numerical Solution of Partial Differential Equations.

PHM 447 Probability and Statistics (1)

Random Variables and Their Distributions, Independence, Moments and Moment Generating Functions, Conditional Probability, Estimation Theory, Testing of Hypotheses, Regression and Correlation

PHM 448 Computer Science (1)

Computer Systems Architectures, Introduction to Information Systems, Introduction to Operating Systems, File Organization and Database Design, Data Communications and Networks, Introduction to Graph Theory.

PHM 449 Operations Research (1)

Basic Definitions, Linear Programming, Sensitivity Analysis, Dual Programming, Goal Programming and Sensitivity.

PHM 450 Differential Geometry (1)

Vectors, Scalar and Vector Products, Linear Dependence and Independence, Differentiation of Vectors, Plane Curves, Tangent, Normal Unit Vector, Curvature, Space Curves, Tangents,

Osculating Plane, Torsion, Moving Trihedron, Frenet Formulas, Intrinsic Equations, Surface Arc, Surfaces, Tangent Plane, Normal Line, Arc Length, Surface Area, First and Second Fundamental Forms, Asymptotic Lines, Geodesics.

PHM 451 Projective Geometry (1)

Introduction, Euclidean and Projective Geometry, Principal of Duality, Projective and Perspective Pencils and Sets, Theorems of Projectivities, Cross Ratio, Invariance of Cross Ratio, Desargues's Theorem, Plane and Space Configuration, Harmonic Sets, Projectivities and Pappus Configuration, Parabolic and Hyperbolic Projections, Intvolutions, Conic, Poles and Polar, Pascal and Brianchon's Theorems, Steiner Circle, Plane Affine and Euclidean Geometry.

PHM 480 Analytical Mechanics (1)

Kinematics of Particles and Rigid Bodies in Three Dimensional Space, Motion Relative to Multiple Moving Reference Frames, Kinetics of a Rigid Body in Three Dimensional Space, Motion of a Particle in a Central Force Field, Lagrangian Mechanics, Hamiltonian Mechanics

PHM 481 Fluid Mechanics

The Equation of Continuity and Boundary Conditions, Rate of Change of Linear Momentum, The Equation of Motion of an Inverted Fluid, The Energy Equation, Irrotationcal Motion Presume Equation, Two Dimensional Motion and Steam Function, Applications on Conferral Representations, Blazes Theorem, Katte and Jorukousbi's Theorem, Two-Dimensional sources and Doublets, Images, Vortex and Vortex Sheet.

PHM 482 Elasticity and Plasticity

Analysis of Stress, Analysis of Strain, Stress-Strain Relations, Axial Loading, Torsional Loading, Flexural Loading, Two-Dimensional Elasto-Static Problems, Physical Basis of Plastic Deformation, Basic Concepts of Plasticity, Application to Several Engineering Problems.

PHM 483 Theoretical Mechanics

Quantum Mechanics in One Dimension, Postulates of Quantum Mechanics,Quantum Mechanics in Three Dimensions, Identical Particles, Time Independent Perturbation Theory, Time Dependent Perturbation Theory.

PHM 484 Introduction to Vibrations and Acoustics

Linear Response of One and Two Degree of Freedom Systems. Rotating Imbalance, Vibration Isolation, Fundamentals of Wave Motion, Vibrating Strings and Bars, The Acoustic Wave Equation, Acoustic Impedances, Sound Propagation, Traveling Wave Solutions, Separation of Variables, The Helmholtz Resonator, Acoustic Waves in Pipes.

PHM 485 Special Topics in Engineering Mechanics

Treatment of Special Topics in Engineering Mechanics By Experimental, Computational and/or Theoretical Methods, Topics Will Vary From Semester to Semester.

PHM 540 General Engineering Mathematics (1)

Linear Algebra, Eigenvalues and Iterative Methods for Finding Them, Numerical Solution of Nonlinear Equations, Interpolation and Curve Fitting, Systems of Differential Equations and Its Methods of Solution.

PHM 541 General Engineering Mathematics (2)

Probability and Statistics, Random Variables and Probability Distributions, Principles of Mathematical Statistics and Goodness of Fit, Linear Programming By Graphs and By Simplex Method.

PHM 542 General Engineering Mathematics (3)

Vector Analysis, Gauss and Stoke's Theorems, Boundary Value Problems in Partial Differential Equations and Methods of Solution, Laplace Transform and Its Applications.

PHM 543 Engineering Statistics

Random Variables, Estimation Theory, Goodness of Fit, Testing of Hypotheses, Regression, Correlation.

PHM 544 Difference Equations (1)

Discrete Calculus, Negative and Factorial Powers and Stirling Numbers, Bernoulli Numbers and Polynomials, Matrix Form, Comparison Principle, Linear Difference Equations: Fundamental Theory – Method of Variation of Parameters – Linear Equations with Constant Coefficients – Method of Generating Functions – Stability and Boundary Value Problems, Linear Systems of Difference Equations: Basic Theory – Autonomous Systems – Poincare Theorem and Periodic Solutions.

PHM 580 Aerodynamics

Linear Dynamics of Flow Field, Kutta, Jorukouski Theorem, Thin Airfoil Theorem, Finite Wing Theory, Compressibility Effects, Performance Characteristics, Applied Aerodynamics.

PHM 581 Vibration Mechanics (1)

Fundamentals of Vibrations, Free Vibrations and Natural Frequency, Harmonically Excited Vibrations, Normal Mode Vibration, Coordinate Coupling, Forced Vibration, Gyrscopic Effect on Rotating Shafts, Properties of Vibrating Systems, Method of Matrix Equations Formulation and Solution.

PHM 582 Analytical Mechanics (2)

Variational Principle and Lagrange's Equations, Hamilton's Conical transformations, Hamilton, Jacobi Theorem, Lagrangian and Hamiltonian Formulation in Continuous Systems, Dynamic Stability and Liapunu's Direct Method.

PHM 583 Continuum Mechanics

Tensor Analysis, Strain and Rate of Strain, Applications of Newtonian Mechanics to Deformable Media, Mechanical Constitutive Equations, Field Equations of Fluid Mechanics and Elasticity.

PHM 600 Advanced Solid State Physics

Crystal Structure, Reciprocal Lattice, Crystal Binding and Elastic Constants, Crystal Vibrations and Phonons, Free Electron Fermi Gas, Energy Bands, Electric and Thermal Conduction in Solids, Semiconductor Devices, Fermi Surfaces and Metals, Optical Processes and Excitons, Superconductivity, Dielectics and Ferro-Electrics, Diamagnetism and Paramagnetism, Ferromagnetism and Antiferromagnetism, Magnetic Resonance, Noncrystalline Solids.

PHM 601 Advanced Quantum Mechanics

Theory of Scattering, Approximation Methods, Tight Binding Model, Variational Method, Density Matrix and Perturbation Theory, Absorption and Dispersion of Radiation in Atomic Media, Relativistic wave equations for Zero and Half Spin particles, Quantum Information and Computing.

PHM 602 Solid State Electronics

Crystalline Structures, Periodic Structures and Reciprocal Space, Waves in Periodic Structures and Brillouin Zones, Lattice Vibrations, Band Structure, Free Electron Model, Tight Binding Model, Band Structure of Selected Semiconductors, Low-Dimensional Structures, Carrier Transport, Boltzmann Transport Equation, Carrier Mobility, Balance Equation Method, Hydrodynamic Model, Monte Carlo Method, Carrier Scattering, Fermi Golden Rule, Impurity Scattering, Acoustic Phonon Scattering, Optical Phonon Scattering.

PHM 603 Physics of Advanced Semiconductor Devices

Deep Submicron and Nano MOSFETs, SOI, Multi Gates Devices, BiCMOS, Hetero-Junction BJTs, Carbon Nanotube Devices and Quantum-Well and Wire Structures.

PHM 604 Optical Properties of Semiconductors

Quantum Theory of The Free Electrons in Solids, Bloch Functions, Kronig – Penney Model for an Electron in a Periodic Field Energy Bands, Brillouin Zones, Effective Mass, The Reciprocal Lattice, Brillouin Zones for Different Crystal Lattices, Important Symmetry Points and Symmetry Lines, Semiconductor Band Structures, Optical Characteristics of Matter (Absorption, Reflection and Transmission), Impurity Energy States in Semiconductors, Shallow and Deep Impurity States, Lattice Vibrations and Phonons, Quantum Transitions in Semiconductors, Optical Absorption in Semiconductors, Intrinsic Absorption, Direct Transitions and Indirect Transitions, Excition Absorption, Effect of Doping on The Fundamental Absorption Edge, Optical Absorption on Lattice Vibrations, Impurity Absorption, Radioactive Recombination in Semiconductors, Light Emitting Diodes.

PHM 605 Introduction to Lasers and Electro-Optics

Semiconductor Physics, Laser Operating Principles, Laser Structures and Properties, Opto-Electronic Modulators and Devices, Opto-Electronic Integrated Circuits.

PHM 606 Opto-Electronic Devices

Overview of Optical Properties of Semiconductors and Elements of Plane Wave Propagation, Theory and Design of Light Emitting Diodes, Laser Diodes and Detectors, Optical Spectra and Transitions, Spontaneous and Stimulated Emission, Population Inversion, Carrier and Optical Confinements in Hetero-Structures, Quantum-Well Lasers, Opto-Electronic

Detectors, Bandgap Engineered Graded Structures, Staircase Type or Super-Lattice Structures for Detectors, Detailed Quantum Efficiency Calculations and Detector Noise Considerations, Introduction to Monolithic Integrated Circuits.

PHM 607 Semiconductor Diode Laser Physics

The Theory of Operation, Manufacture, Application of Semiconductor Diode Lasers, InGaAsP Diode Lasers, Applications in Optical Communication Systems.

PHM 608 Solar cells

Energy Needs: Energy Sources, Consumption, Conventional Sources of Energy, Alternative Energy Sources, The Sunlight: Solar Spectrum and Common Expressions, Geometrical Effects, Light Collections for Solar Cells, Principle of The Photovoltaic Conversion, The Solar Cell: Semiconductors, The p-n Junction, Heterojunction, Shottky Barriers, Optical Effects in Semiconductors and Semiconductor Junctions, Fundamental Equation of The Solar Cell and The Equivalent Circuit, Maximum Efficiency of The Solar Cell, Factors Affecting The Efficiency of The Solar Cell, Choice of Materials, Limitations on Photovoltaic Energy Converters, Fabrications of The p-n Junction Solar Cells, Thin Film Solar Cells, Solar Cell Array, Reliability of a Solar Cell System.

PHM 609 Microwave Devices

History and Concepts of Microwave Semiconductor Devices, Varactors, Gunn Diodes, Schottky Barrier Diodes, MESFET, High Electron Mobility Transistors, and Quantum Well Devices, Transient Time Microwave Semiconductor Devices.

PHM 610 Advanced Laser Physics

Mutual Interaction Between Intense Optical Radiation and Gases, Density Matrix, Optical Block Equations, Coherence Effects, Saturation Spectroscopy, Optical Pumped Lasers, Selected Topics in Advanced Laser Physics.

PHM 611 Photo-Electrochemical Properties of Semiconductors

Potentials and Thermodynamic of Cell, Kinetics of Electrodes Reaction and Electrolyte Solution, Processes at Semiconductor Electrodes, Electrochemical Instrumentation, Spectrometric and Photochemical Experimental.

PHM 612 Solid State Devices

Characteristics, Models, and Limitations of Selected Semiconductor Device Structures: Diodes, Transistors, Integrated Circuit Devices, Charge-Coupled Devices, Multi-Layer Devices, Opto-Electronic and Magnetic Devices, Electro-Luminescent, Photovoltaic and Photo-Detector Devices, Magnetic Bubble Devices, Memory Devices.

PHM 613 Mesoscopic Physics

Semiconductor Growth Technologies: Bulk, Thin Films, and Nanostructures, Fabrication and Growth of Quantum Dots, Epitaxial Growth of Self-Assembly Quantum Dots, Coherence and Mesoscopic Systems, Scattering in a Two-Dimensional Electron Gas (2DEG), Coulomb Blockade and Single Electron Transistor, Electronic Properties of Self-Assembled Quantum Dots, Quantum Wire.

PHM 614 Quantum Theory of Nanostructures

Microscopic Electronic Properties of Heterostructures, Mesoscopic Aharonov-Bohm Oscillations in Metallic and Semiconductor Heterostructure Rings, Density of States of Quantum Wells, Wires, Dots and Superlattices, Electronic and Optical Properties of Quantum Wells, Wires, Dots and Superlattices, Excitons in Quantum Wells, Wires, Dots and Superlattices- Creation and Detection of Mobile and Non-Local Spin, Entangled Electrons in Different Quantum Systems, Electronic Properties of Graphene and Carbon Nanotubes.

PHM 615 Nanostructure and Nanomaterials Synthesis, Properties and Applications

Emergence of Nanotechnology, Synthesis of Semiconductor Nanoparticles, Carbon Fullerenes and Nanotubes, Micro and Mesoporous Materials, Scanning Tunneling Microscopy (STM), Atomic Force Microscopy (AFM), Physical Properties of Nanomaterials, Band Gap Engineered Quantum Devices (Wires and Dots), Carbon Nanotube Emitters, Photoelectrochemical Cells, Photonic Crystals and Plasmon Waveguides.

PHM 616 Transport Theory in Materials

Diffusive Transport, Boltzmann's Transport Equation, Weak Localization, Anderson Localization, Ballistic Transport, Landauer Equation, Two Dimensional Electron Gas (2DEG), Transport Through Nanoscale Devices (for Example Quantum Dots and Nanowires), Conductance Fluctuations, Quantum Hall Effect, Noises in Nanoscale Devices, The Nonequilibrium Green's Function and Its Applications in Nanoscale Devices.

PHM 617 Quantum Transport

Low Dimensional Structures, Ballistic Transport in Nanowires, Carrier Scattering, The Hydrodynamic Model and The Balance Equation Method, The Monte Carlo Method, Tunneling, Scattering Formalism (Landauer Formalism), The Nonequilibrium Green's Function Formalism, Transport in Carbon Nanotubes.

PHM 618 Simulation and Modeling of Semiconductor Devices

Monte-Carlo Method, The Foundation of Modeling and Electronic Transport, Simulation of Bulk Properties of Solids and Low-Dimensional Solids, Steady State Simulation of Devices, Wandering Gunn Domains, Theory of Noise Turbulence and Chaos.

PHM 619 VLSI and Nanoscale Technologies

Crystal Growth and Wafer Preparation, Epitaxy, Oxidation, lithography, Plasma Etching, The CVD, Deposition, Ion Implementation, Metallization, Process Simulation, VLSI Process Integration. Self Assembly, Electron Beam Lithography, Nano- Wire/Needle/Tube and Quantum Dot Synthesis. The Synthesis Methods Include: Molecular Beam Epitaxy, Metal-Organic Chemical Vapor Deposition (CVD), Catalyst CVD, Vapor Liquid Solid, Electrodeposition, Pulsed Laser Synthesis, Solution-Based Synthesis, Yield and Reliability.

PHM 620 Electrodynamics (2)

Basic Notions in Quantum Field Theory, Electron-Photon Interaction, Relativistic Perturbation Theory, Feynman Diagrams.

PHM 621 Numerical Methods for Light Propagation

Maxwell's Equations, Effective Index Method, Modal Analysis, Two and Three Directional Beam Propagation Methods, Bi-Directional Beam Propagation Method, Finite Difference Time Domain Method, Finite Element Method, Radiation Spectrum Method.

PHM 622 Light Polarization

Types of Polarization (Linear Polarization, Circular Polarization, Elliptical Polarization), Linear Polarizers, Circularly Polarizing Sheets, Phase Retarders, Degree of Polarization, Completely Polarized Light, Partially Polarized Light, Unpolarized Light, Jones Matrices, Muller Matrices, Stokes Parameters, Poincare Sphere, Representation of Light Polarization on Poincare Sphere, Light Polarizers, Polarization Splitters, Polarization Controllers.

PHM 623 Optical Devices

Maxwell's Equations, Modal Analysis of Slab Waveguides, Different Types of Modes, Effective Index Method, Multimode Interference Devices, Waveguide Couplers, Integrated Polarization Converters Using Periodic Structure, Slanted Angle Polarization Converters, Integrated Mach-Zehnder Modulator, Y-Junction.

PHM 624 Physical Properties of Thin Films

Electrical Properties of Continuous Thin Films, Electrical Properties of Discontinuous Metallic Thin Films, Electrical Properties of Cermet Films, Optical and Magnetic Properties of Thin Films.

PHM 625 Thin Film Technology

How to Attain Vacuum, Different Methods for Preparing Thin Films, Nucleation and Growth of Thin Films, Structure of Thin Films, Determination of The Film Thickness.

PHM 626 Thin Film Devices and Sensors

Resistor, Capacitor and Inductors in The Form of Thin Films, Thin Film Transistors, Thin Film Integrated Circuits, Thin Film Sensors, Discontinuous Metal Films as Extremely Sensitive Sensors.

PHM 627 Surface Properties of Solids

Surface Energy, Surface Contact Between Different Solids, Surface Phenomena, Structure of Surfaces.

PHM 628 Special Theory of Relativity

Lorentz Transformations (Length, Time-Energy and Momentum), Relativistic Dynamics, Gravitation and Light, Doppler Effect, Transformation of Electromagnetic Field, Field of a Moving Charges.

PHM 629 Theoretical Physics

The Theory of Relativity, Quantum Mechanics, Statistical Physics, Plasma Physics, Chaos in Dynamic Systems, Group Theory.

PHM 630 Atomic Physics (2)

Sodium Spectra and Zeeman Effect, X – Rays, Molecules and Molecular Spectra, Raman Effect, Nuclear Structure.

PHM 631 Elementary Particle Physics

Comparison Between Cosmic Ray Sources and Laboratory Sources of Elementary Particles, Conservation Laws and Their Relations to Different Elementary Particles, Fundamental Properties of Elementary Particles and Methods to Determine Them, Strong Interactions of Elementary Particles, Electromagnetic Interactions of Elementary Particles, Weak Interactions of Elementary Particles Within The Framework of Quantum Mechanics.

PHM 632 Plasma Physics (2)

Transport Phenomena in Weakly Ionized Gas, Transport of Charged Particles in Weakly Ionized Gas, Plasma in External Fields, Waves in Plasma, Radiation in Gases, Plasma in the Upper Atmosphere.

PHM 633 Nuclear Physics (2)

Applications of Many Body Techniques to Nuclear Structure and Nuclear Matter, Experimental Methods, Medium Energy Phenomena, Theory of Nuclear Reactions.

PHM 634 Reactor Physics

Chain Nuclear Reaction and Reactor Fuel Characteristics, Control of Speeds of Neutron Fluxes and Moderator Characteristics, Control of Temperature and Neutron Flux, Different Types of Nuclear Reactors and Their Design, Nuclear Reactors Manipulation and Safeguard Measures Against Nuclear Reactor Accidents, Nuclear Shielding Measures and Safe Measures to Store Nuclear Radiation Wastes, Relation Between Nuclear Reactors and Other Energy Generation Sources.

PHM 635 Resonance Particle Physics

Detection Methods of Resonance Particles, Resonance Interactions of Mesons, Resonance Interactions of Baryons, Quantum Treatment of Resonance Interactions.

PHM 636 Mathematical Physics

Tensor Algebra, Differential Geometry, Topology, Lie Groups and Lie Algebras, Distribution Theory, Functional Analysis and Hilbert Spaces, Green's Functions for Ordinary Differential Equations and Multidimensional Spaces.

PHM 637 Selected Topics in Advanced Physics

Theoretical Physics, Atomic Physics and Collision Theory, Nuclear Physics and Reactors, Physics of Condensed Matter, Theory of Dielectrics, Solid State Devices, Photo – Conductivity in Solids, Elementary Particle Physics.

PHM 640 Functions of Complex Variable (2)

Infinite Products, Entire Functions, Analytic Continuation, Reimann Surfaces.

PHM 641 Special Functions

Special Functions in The Real and Complex Domains: Bessel, Legendre, Hermite, etc.., Applications.

PHM 642 Ordinary Differential Equations (2)

Existence and Uniqueness of Solutions, Linear Systems with Constant, Periodic and Analytic Coefficients, Singularities of Autonomous Systems, Self-Adjoint Eigenvalue Problem, Expansion in Terms of Eigen Functions, Stability Theory and Liapunov Functions.

PHM 643 Integral Transforms

Detailed Study of Different Kinds of Integral Transforms with Their Properties and Applications.

PHM 644 Integral Equations

Volterra Integral Equations, Resolvent Kernel, Euler Integrals, Fredholm Equations of The Second Kind, Iterated Kernels, Degenerate Kernel, Approximate Methods of Solving Integral Equations.

PHM 645 Operator Theory

Spaces of Operators and Dual Spaces, Linear Functions and Operators on Hilbert Space, Rings of Operators, Sequences of Operators, Fixed Point Principle.

PHM 646 Probability and Statistics (2)

Markov Chains, Queuing Theory, Reliability Theory, Information Theory and Coding.

PHM 647 General Topology

Set Theory, Cardinal and Ordinal Number, Topological Spaces, Metric Spaces, Plane Topology, Continuity, Connectedness and Compactness in R.

PHM 648 Computer Science (2)

Analysis of Algorithms, Programming Languages, Introduction to Automata Theory, Computer Graphics, Artificial Intelligence, Application of Discrete Mathematics to Computers.

PHM 649 General Applied Mathematics

Systems of Linear Differential Equations, Matrices, Vector Analysis, Tensor Analysis, Fourier Integral with Application to Differential Equations, Sturm-Lioville Problems, Bessel and Legendre Functions and Series, Calculus of Variation, Integral Equations.

PHM 650 Discrete Mathematics

Logic and Proofs, Algorithms, Counting Methods, Pigeonhole Principle, Network Models, Petri Nets.

PHM 651 Graph Theory

Permutations and Combinations, Generating Functions, Recurrence Relations and Difference Equations, Analysis of an Algorithm, Basic Theory of Directed and Undirected Graphs, Sub-

Graphs, Chains, Circuits, Paths, Cycles, Connectivity and Trees, Minimal Paths, Applications to Computer Science.

PHM 652 Operations Research (2)

Linear programming and Modeling, Sensitivity analysis, Goal programming and its stability, Transportation problems, Integer programming, Game theory and its applications.

PHM 653 Finite Element Methods

Ritz Method and Its Convergence, The Method of Finite Differences, Finite Element Method, Two- and Three-Dimensional Poisson-Equations, Higher-Order Approximations, Fixed-Element Shapes.

PHM 654 Abstract Algebra (2)

Field Theory, Galois Theory, Introduction to Hormological Algebra, Structure Theory for Rings with The Minimum Condition.

PHM 655 Real Analysis (2)

Euclidean and Metric Spaces, Series, Differentiability, Riemann-Stieltjes Integral, Sequences and Series of Functions, Measure and Integration, Lebesgue Integral, Fubini's Theorem, Lp Spaces.

PHM 656 Functional Analysis

Normed Linear Spaces, Banach Spaces, Hilbert Spaces, Distribution Theory.

PHM 657 Partial Differential Equations (2)

Laplace's Equation, Green's Functions, Complex Variable Methods, Sturm-Llioville Problem and Eigen-Function Expansions, Hilbert Space Methods for Elliptic Equations, Existence, Uniqueness, Regularity.

PHM 658 Numerical Analysis (2)

Approximation By Spline Functions, Minimization of Multivariate Functions, Approximation of Functions, Detailed Examination of Numerical Methods for Solving Differential Equations with Emphasis on Error Propagation.

PHM 659 Projective Geometry (2)

Axioms of Incidence in Space, Homogeneous Coordinates, Some Fundamental Projective Theorems, Pappus Theorem, Desargues's Theorem, Principle of Duality, Cross-Ratio, One-to-One Correspondence, Ranges and Pencils, Harmonic Pencils, Involution, Conics Analytically Treated, Degenerate Conic, Pascal and Brianchon's Theorems, Chasles's Theorem, Pole and Polar, Parametric Form of Comic, Isotropic Lines, Correspondence on Conic sections.

PHM 660 Differential Geometry (2)

Vectors, Scalar and Vector Products, Differentiation, Dependence, Plane and Space Curves, Tangents, Arc Length, Osculating and Tangent Plane, Moving Trihedron, Torsion, Surfaces, Normal Line, Area, First and Second Fundamental Forms, Geodesics, Principal and Gaussian Curvature, Mapping and Transformations of Surfaces, Developable and Non-Developable

Surfaces, Conformal Mapping, Introduction in Map Projection, Mercator, Stereographic Maps, Isometric Mapping, Equator Maps, Lambert's Map.

PHM 661 Four Dimensional Descriptive Geometry

Introduction to Higher-Dimensional Geometry, Analytical Discussion for The Elements of The High-Dimensional Spaces, System of Reference, Representation of The Geometrical Elements in the Fourth Dimension, Problems of Position, Metric Problems, Representation of Polytopes, Hypercircle, Hypersphere, Hypercone, Hypercylnder,....etc.

PHM 662 Advanced Descriptive Geometry

Indexed Projection, Representation of The Geometrical Elements, Problems of Position, Metric Problems, Solids, Topographic Surfaces, Slopes of Excavation and Filling, Axonometric Projection, System of Reference, Representation of Elements, Straight Line, Plane, Polyhedrons, Circle, Sphere, Cone, Cylinders, Surfaces of Revolution, The Helical Surfaces, Inclined Axonometric Projection.

PHM 663 Advanced Engineering Mathematics (1)

Laplace Transform, Series Solution of Differential Equations, Special Functions Including Bessel and Legendre Functions, Functions of a Complex Variable, Evaluation of Real Integrals By Residues.

PHM 664 Advanced Engineering Mathematics (2)

Systems of Linear Differential Equations, Vector Analysis, Tensor Analysis, Fourier Integral Applied to Ordinary and Partial Differential Equations, Calculus of Variation, Boundary Value Problems and Green's Functions.

PHM 665 Engineering Numerical Analysis

Number Representation and Errors, Iterative Methods in Matrix Algebra, Eigenvalues, Nonlinear Equations, Numerical Differentiation and Integration, Numerical Solution of Ordinary and Partial Differential Equations, Spline.

PHM 666 Engineering Probability and Statistics

Random Variables and Their Distributions, Independence, Moments and Moment Generating Functions, Conditional Probability, Estimation Theory, Testing of Hypotheses, Regression and Correlation.

PHM 667 Special Topics in Higher Mathematics(1)

Selected Topics in: Differential Equations, Integral Equations, Linear Algebra, Numerical Analysis, Probability and Statistics, Partial Differential Equations, Graph Theory, Discrete Mathematics, Boundary Value Problems.

PHM 668 Special Topics in Higher Mathematics(2)

Selected Topics in: Abstract Algebra, Functional Analysis, and Algebraic Topology.

PHM 669 Operations Research (3)

Network, PERT and CPM, Linear Programming and Applications, Simplex Techniques, Sensitivity Analysis, Transportation Problems, Dynamic Programming.

PHM 670 Real Analysis (2)

Connected Sets, Bounded and Totally Bounded Sets, Complete and Compact Metric Spaces, Continuous Functions on Compact Metric Spaces, Uniform Continuity, Sets of Measure Zero, Riemann Integral, Fundamental Theorems of Calculus and Improper Integrals, Sequences and Series of Functions: Pointwise and Uniform Convergence and Its Consequences – Integration and Differentiation of Series of Functions.

PHM 671 Real Analysis (3)

Weierstrass Approximation Theorem, Picard Existence Theorem, The Arzela Theorem on Equicontinuous Families, Length of Open and Closed Sets, Measurable Sets and Their Properties, Measurable Functions, General Theory of Lebesgue Integration Including All Details, L^2 Theory of Fourier Series, Orthonormal Expansions in $L^2[a, b]$.

PHM 672 Difference Equations (2)

Stability Theory: Stability Notions - The Linear Case – Autonomous Linear Systems - Linear equations with Periodic Coefficients – Stability by First Approximation – Liapunov Functions – Converse Theorems – Total and Practical Stability, Difference Equations as Banded Matrices: Initial and Boundary Value Problems – Cyclic Reduction, Applications to Numerical Analysis: Iterative Method, Local and Semilocal Results – Miler's – Olver's and Glenshaw's Algoriths – Monotone Iterative Methods and Approximations.

PHM 680 Special Topics in Mechanics

Definitions, Axioms and Comparison with Euclidean Geometry, Parabolic Geometry, Elliptical Geometry, Hyperbolic Geometry.

PHM 681 Statistical Mechanics

Principles of Statistical Mechanics, Applications of The Canonical Distribution, Statistical Thermodynamics of Gases, Applications of Fermi and Bose Statistics, Strongly Interacting Systems, Fluctuations and Kinetic Theories.

PHM 682 Vibration Mechanics (2)

Vibration under General Forcing Conditions, Determination of Natural Frequencies and Mode Shapes, Different Approximate Methods of Determination of Natural Frequencies and Mode Shapes of Continuous Systems, Bending Vibrations of Timoshinkov's Beam, Wave Propagation in Solids, Torsional Vibrations of Continuous Beams, Axial Vibrations of Continuous Beams.

PHM 683 Theory of Elasticity

Tensor Analysis, Equation of Elasticity in Curvilinear and Rectangular Coordinates, Problems of Prismatic Bars, Variational Methods and Energy Principles, Thermal Stress Problems.

PHM 684 Space Mechanics

Review of Orbital Mechanics, Advanced Rigid Body Dynamics, Dynamics of Interconnected Rigid Bodies, Rotor Dynamics, Dynamic Stability (Types and definitions) Routh, Husritz Stability Criterian, Lipunov Stability Theories and Methods, Gravity Gradient Torque and Its Application in Space Mechanics, Satellites Dynamics and Stability.

PHM 685 Nonlinear and Random Vibration Mechanics

Exact Solutions and Sectional Linearization, Free and Forced Vibration of Mechanical Systems with Nonlinear Restoring Forces, Self Excited Mechanical Vibrations and Relaxation Vibrations, Nonlinear Vibration of Mechanical Systems with More Than One Degree of Freedom, Nonlinear Vibrations of Bounded Continuous Media, Random Excitation and Random Response, Random Vibrations of Mechanical Systems and Structures, Failure of Materials under Random Vibrations.

PHM 686 Theory of Plates

Analysis of Bending, Buckling and Vibration of Plates, Slabs and Membranes, Equations in Curvilinear Coordinates, Complex Variable Method, Variational Principle and Approximate Anisotropic and Nonhomgenous Plates, Thermal Stress Problems.

PHM 687 Theory of Shells

Thin shells, Cylindrical Shells, Shells Having the Form of a Surface of Revolution, Shells of Double Curvature, Variational Methods and Energy Principles, Various Approximate Methods of Analysis, Buckling and Vibrations, Thermal Stress Problems, Nonlinear Theory.

2. Department of Structural Engineering

CES 510 Numerical Analysis in Structural Engineering

Approximate and Variational Methods Suitable for The Analysis of Various Types of Structures, Finite Difference Method, Finite Element Method, Matrices, Matrix Algebra, Direct and Indirect Solutions of Simultaneous Equations, Eigenvalue Problem, Determination of Eigenvalues and Eigenvectors, Application of These Methods to Practical Problems of Special Interest, Computer Implementation.

CES 511 Advanced Structural Analysis

Matrix Methods of Structural Analysis, Substructures, Transfer Matrices, Computation Methods, Finite Differences Applied to Continua, Energy Theorems, Variational Methods.

CES 512 Dynamics of Structures

Types of Dynamic Loads, Types of Structural Systems, Free and Forced Vibrations, Solution of Eigenvalue Problem, Modal Superposition Method, Deterministic Time Domain Integration Method, Stochastic Method, Duhamel Integral, Response Spectrum, Applications.

CES 513 Theory of Elasticity in Structural Engineering

Vectors, Tensors, Stress Tensors, Strain Tensors, Constitutive Equations for Linear Elasticity, Strain Energy, Compatibility Equations, Formula of Elasticity Problems, Variation Principles and Energy Methods in Elasticity, Introduction to The Theory of Plasticity.

CES 514 Plastic Analysis of Structures

Basic Concepts of Plastic Analysis, Theorems, Static Method, Method of Virtual Work Applications.

CES 515 Computer Analysis of Structures

Introduction to Computers, Languages, Programming, Programs for Internal Forces, Deflection of Beams, Section Properties, Normal Stresses, Shear Stresses, Principle Stresses, Interaction Diagrams, Design of Short and Slender Columns.

CES 516 Introduction to Solid Mechanics

Vectors, Tensors, Stress Tensors, Strain Tensors, Constitutive Equations for Linear Elasticity, Strain Energy, Compatibility Equations, Formula of Elasticity Problems, Variational Principles and Energy Methods, Stress Deviator, Hydrostatic Stress Tensors, Strain Flow Condition, Tresca and Von Misses Criteria, Hencky and Pandtlreuss Relationships.

CES 517 Stability of Steel Structures (1)

Different Methods of Analysis, Imperfect Columns, Inelastic Buckling, Buckling By Approximate Methods, Beam Columns.

CES 520 Properties and Testing of Materials

Fundamental Properties of Materials, Types of Materials, Principals of Testing, Different Types of Testing, Code of Practice and Specifications.

CES 521 Statistics in Structural Engineering

Studying Random Variables and its Coefficients of Variations, Normal Log, Normal Probability Density Function and Probability of Failure for Different Structural Elements.

CES 522 Experimental Stress Analysis and Strain Measurement

Elementary Elasticity, Photo-Elasticity, Model Analysis, Strain Analysis, Strain Measurements Methods and Related Instrumentation.

CES 523 Methods of Repair and Strengthening

Causes of Defects, Evaluation of Structures, Materials for Repair and Strengthening, Repair Methods, Strengthening Methods.

CES 524 Quality Control and Quality Assurance

Concrete Mixture Design Methods, Technical Inspection, Quality Control Steps, Components of Quality Assurance, Conceptual Basis for Quality Assurance Schemes.

CES 525 Effect of Materials Manufacture on Environment

Sources of Environment Pollution, Manufacture of Construction Materials, Methods and Means of Environment Pollution Measurement, Distribution of Construction Materials Factories in Egypt, Effect of Manufacture Technology Development on Environment.

CES 526 Special Types of Concrete

Light Weight Concrete, High Density Concrete, Fiber Reinforced Concrete, Polymer Concrete, High Performance Concrete, Steam Cured Concrete.

CES 527 Deterioration and Durability of Concrete

Permeability of Concrete, Effect of Weathering on Concrete, Effect of Sea Water on Concrete, Carbonation of Concrete, Sulfate Attack, Freezing and Thawing Resistance, Corrosion of Steel Reinforcement in Concrete Structures, Alkali and Carbonate Aggregate Reaction, Abrasion Resistance of Concrete, Fire Resistance of Concrete

CES 528 Advanced Construction Materials

Types of New Construction Materials, Process Technology, Behavior and Properties, Applications.

CES 529 Fracture Mechanics and Fatigue

Fracture Mechanics for Metals, Fracture Mechanics of Brittle Materials, Experimental Evaluation of Fracture Properties, Fatigue of Plain and Reinforced Concrete, Fatigue of Metals.

CES 530 Modern Concrete Bridges

Types of Concrete Bridges, Analysis and Design of Box Girder Bridges, Skew Bridges and Curved Bridges, Construction Techniques, Cable Stayed and Suspension Bridges, Composite Bridges.

CES 531 Prestressed Concrete Structures

Design of Prestressed Concrete Beams, Losses in Prestressing Force, Fully and Partially Prestressed Concrete Structures, Limit States Design, Working Limits, FRP Reinforcement, Ultimate Limit Analysis, Shear Design, End Blocks, Continuous Beams, Frames, Flat Slabs.

CES 532 Analysis and Design of Special Concrete Structures

Prefabricated Buildings, Masonry Structures, Analysis and Design of Special Concrete Structures By Strut and Tie Method, Deep Beams with Openings, Shear Walls, Short Cantilevers, Beams of Variable Cross Section, Pre-Stressed Beams, and Design of Prestressed Beams with Fiber Reinforced Polymers.

CES 533 Computer Applications in RC Structures

Computing Platforms, Analysis and Design Packages, Package Selections, Available Commercial Computer Packages, and Moment-Curvature Analysis of Concrete Sections.

CES 540 Geological Engineering & Rock Mechanics

Plate Tectonics, Minerals, Rock Types, Geological Structures, Dating and Geological Time Scale, Geological Maps, Engineering Properties and Classification of Intact Rock, Classification and Characteristics of Rock Discontinuities, Rock Mass Geotechnical Classification

CES 541 Site Investigation and Laboratory Testing

Elements of Geotechnical Site Investigation, Drilling and Sampling Techniques in Soils and Rocks, In-Situ and Laboratory Testing of Soils and Rocks, Use of Geophysics in Geotechnical Site Investigation, Fundamentals of Geotechnical Instrumentation.

CES 542 Soil Structures

Classification of Soil Structures, Compaction of Granular and Cohesive Materials, Selection of Suitable Soils and Rocks, Equipment Used in Earth Works, Slope Stability Assessment in Soil and Rock, Slope Stabilization Measures, Design Aspects of Earth-Embankments and Rockfill Dams.

CES 543 Advanced Foundation Engineering

Fundamentals of Soil-Structure Interaction, Bearing Capacity of Shallow and Deep Foundations, Settlement of Shallow and Deep Foundations, Behavior of Laterally Loaded Piles, Pile Group Action, Piled Raft Foundations, Supported Deep Excavation, Construction Technologies of Foundation Engineering.

CES 544 Ground Improvement

Shallow Compaction, Soil Reinforcement and Geotextiles, Chemical, Compaction, and Injection Grouting, Vibroflotation and Stone Columns, Vertical Drains, Preloading of Compressible Soils.

CES 545 Environmental Geotechnique

Groundwater Pollution and its Classification, Dispersion Characteristics of Soils, Methods of Groundwater Protection, Industrial Waste Disposal and its Side Effects, Design of Waste Disposal Sites.

CES 546 Dewatering

Wells, Dewatering Systems, Seepage Control, Filter Design and Study Cases.

CES 550 Special Steel Structures (1)

High Rise Buildings Composite Analysis and Construction, Steel Tanks, Steel Silos.

CES 551 Fabrication, Erection and Maintenance of Steel Structures

Fabrication of Steel Structures, Automatic Production Lines, Mass Production, Tolerances, Different Methods of Erection, Methods of Strengthening, Inspection and Maintenance Requirements of Steel Structures.

CES 552 Behavior of Steel Structures (1)

Critical Evaluation of The Actual Behavior of Metals, Connections, Members and Structures, Significance of This Behavior in Terms of Design, Development of Design Specifications.

CES 553 Stability of Steel Structures (2)

Modified Slope Deflection Equations, Torsional Buckling of Columns, Torsional Flexural Buckling, Buckling of Plates.

CES 554 Design of Steel Transmission and Antenna Towers (1)

Types of Transmission and Antenna Towers, Loads, Cases of Loading, Diaphragms, Design of Elements, Different Codes

CES 555 Advanced Design of Steel Bridges (1)

Design and Construction of Steel Bridges, Analysis and Design of Plate Girders, Analysis and Design of Truss Bridges, Analysis and Design of Box Girder Bridges and Arch Bridges.

CES 556 Plastic Analysis and Design of Steel Structures

Basic Concepts of Plastic Analysis, Plastic Hinge Formation, Development and Analysis of Collapse Mechanism, Beam Mechanism, Sway Mechanism, Combined Mechanism, Bases of Plastic Design, Analysis and Design of Flexural Beams, Frames and Connections, Secondary Design Problems.

CES 557 Steel Plated Structures

Behaviour and Design of Orthotropic Structures, Steel Hollow Section Structures, Different Applications in Trusses and Arches, Cold Formed Structures: Theory and Behaviour, Composite Decks, Design of Steel Tanks and Silos.

CES 558 Thin Walled Steel Structures (1)

Stability of Plates and Thin Elements Under Different Stresses and Conditions, Studying The Post Buckling Behavior of Plates, Design of Cold Formed Members to Resist Axial Tension and Axial Compression.

CES 560 Bids and Contracts

Preparation of Bids, Tendering Documents, Contract Types and Conditions, Sub Contracting, Insurance and Quality Assurance, Claims, Arbitration.

CES 562 General Management in Construction Projects (1)

Life Cycle of Construction Projects, Organizations Contracts Concepts, Relationships and Responsibilities of All Participants in The Construction Projects, Reconstruction Investigations, Construction Phase Responsibilities, Applications.

CES 564 Projects Planning and Control (1)

Construction Planning and Organizations, Planning Techniques, Check List, S-Curve, Bar Chart, Matrix Schedule, Line of Balance, Network, CPM and PERT, Resource Allocation and Leveling, Linear Programming and Applications.

CES 565 Projects Planning and Control (2)

Simplex Techniques, Transportation Problems, Monte-Carlo Simulation and Applications, Dynamic Programming, Queuing Theory and Applications, Stock Control.

CES 566 Construction Equipment

Major Mechanical Operations, Earth Moving Equipment, Hoisting Equipment, Conveying, Pumping Batching Plant, Pile Driving, Planning and Selection of Equipment, Production Estimates, Sizing, Matching, Economics of Construction Equipment, Preventive Maintenance and Repairs, Systems Approach to Planning and Applications.

CES 567 Matrix Analysis of Structures

Matrix Formulation of The Governing Equations of Framed Structures, Linear Elastic Behavior, Material and Geometrical Nonlinearities, Force and Displacement Methods.

CES 568 Computer-Aided Analysis and Design of Framed Structures

Computer-Aided Analysis and Design of Building Structures, Modeling Considerations, Interpretation of Output, and Checking of Results.

CES 569 Computer-Aided Structural Engineering

Study of Professional and Practice Issues Related to The Proper Use of Computers in Structural Engineering Design

CES 601 Advanced Structural Modeling

Analysis of Structures Using Finite Elements, Discussion of Factors Which Affect The Modeling Including Geometry, Boundary Conditions, Properties, and Loadings, Case Studies of Two- and Three-Dimensional Structures.

CES 602 Advanced Structural Design

Use of Advanced Computational Techniques As The Basis for Design of Complex Structural Systems Including Highrise Buildings and Long Span Bridges, Design of Shear Wall Core Systems, Special Detailing for Earthquake Resistant Reinforced Concrete and Structural Steel Buildings and Repair and Strengthening of Structures.

CES 603 Advanced Engineering Programming Methods

Advanced Engineering Programming Concepts and Their Implementation on Digital Computer, Top-Down Program Development Using Formal Data Structures and Algorithms for Programming Static and Dynamic Engineering Programs.

CES 604 Computational Methods in Structural Mechanics

Introduction to Numerical Techniques in Structural Mechanics, Solution of Large Systems of Linear Equations and Eigenvalue Problems.

CES 605 Nonlinear Finite Element Methods

Modeling of Mechanical Deformation Processes in Solids and Structures By The Finite Element Method, PDE Models of Deformations in Solids and Structures, Weak Form, Weighted Residuals Method, Material Models for 3D Solids and Rods, Beams, Shells, Elasticity, Plasticity, Viscoelasticity.

CES 610 Theory of Plasticity

Stress Conditions, Stress Tensor, Stress Deviator, Hydrostatic Stress Tensor, Strain and Strain Flow Conditions, Yield Criteria, Tresca and Von Misses Criteria, Strain Relationships, Hencky and Prandtlreuses Relationships.

CES 611 Wind and Earthquakes Engineering

Nature and Characteristics of Wind and Earthquakes, Main Assumptions, Governing Equations for Analysis, Quasi Static Method, Stochastic Method, Step By Step Integration Method, Code Requirements, Applications.

CES 612 Plates and Shells

Theory of Thin Plates, Rectangular Plates Skew Plates, Circular Plates, Method of Solution, Shells of Double Curvature, Bending and Buckling of Plates, Isotropic and Ortho-Tropic Shell Structures, Design of Shell Structures with Different Boundary Conditions, Applications.

CES 613 Finite Element Method

Development of Displacement-Based Element for Liner Elastic Stress Analysis, Variation and Other Methods for Element Formulation, Plate Bending and Shell Element, Finite Element Programming, Nonlinear Analysis, Nonlinear Finite Element Formulation, Large Deformations and Material Non-Linearity, Visco-Elastic and Visco-Plastic Formulation, Heat Conduction, Fluid Flow.

CES 614 Suspension and Guyed Structures

Classification of Suspension and Guyed Structures, Construction Materials, Joint Details, Design Considerations, Static Analysis, Dynamic Analysis, Computer Programming for Suspension and Guyed Structures, Practical Applications.

CES 620 Facilities for Renewable Energy

The Course Will Focus on Technology and Materials for Structural Elements Used in Renewable Energy Facilities Such As Biogas Production, Wind Farms, Ethanol Production, Biodiesel, Solar Towers and Chimney, etc.

CES 621 Advanced Quality Control Approach for Concrete Structures

Introduction to Total Quality Management, Quality Assurance Systems, Tools and Team Work, Effective Leadership, Competitors, Process Control, Quality Chain, Customer-Supplier Relation, 3-D Model for TQM, Quality Control Plan, Quality Assurance System, Total Quality Management, Factors Causing Variations in The Concrete Quality, Field Control, Internal Versus External Quality Control, Technical Inspection of RC Projects, Testing of Materials, Testing of Concrete, Models for Quality Control Tests, Statistical Quality Control.

CES 622 Evaluation and Rehabilitation of Concrete Structures

Evaluation of Concrete Structures Prior to Rehabilitation, Condition Survey of Concrete, Diagnosis of Deterioration in Concrete Structures, Durability of Reinforced Concrete Structures, Investigation and Assessment, Petrographic Examination of Distressed Concrete.
Causes, Evaluation, and Repair of Cracks in Concrete Structures, Non-Structural Cracks in Concrete, Corrosion of Reinforcement in Concrete, Corrosion Rate Measurement, Analysis of Hardened Concrete, Non-Destructive Test Methods for Evaluation of Concrete in Structures, Review of NDT Survey Techniques, Materials for Repair, Selecting and Specifying Materials for Repair of Concrete Surfaces, Use of Epoxy Compounds with Concrete, Selection of Polymer Adhesives with Concrete, Surface Preparation for The Repair of Deteriorated Concrete, Selecting Application Methods for The Repair of Concrete. Special Cases: Fire Damaged Constructions, Underwater Structures, Nuclear Safety Structures, Pavements and Parking Areas, Bridges, Etc..., Reports.

CES 623 Advanced Methods for Repair and Strengthening of Structures

Definitions and Strategies of Repair, Rehabilitation, Strengthening, Protection, and Maintenance for Structures, Traditional Materials Used for Repair and Strengthening Works (E.G. Mortar, Concrete, Steel), Advanced Materials Used for Repair and Strengthening Works (E.G. Fiber Reinforced Polymers Sheets, Laminates, and Structural Sections), Advanced Techniques for Repair and Strengthening of Concrete Structures (E.G. Interior Reinforcing, Exterior Reinforcing, Exterior Post-Tensioning, Jackets and Collars, Supplemental Members, and Externally Bonded Reinforcement), Bond Between Repair and Strengthening Materials and Base Concrete, Design, Detailing Rules, Practical Execution and Quality Control for Advanced Repair and Strengthening Methods, Selection of Suitable Repair and Strengthening Methods Based on Structure Characteristics, Cost, Time and Quality Control, Testing of Advanced Repair and Strengthening Materials, Case Studies for The Use of The Advanced Methods for Repair and Strengthening Works.

CES 624 Testing of Products and Structures

Testing of Pipes, Testing of Cables, Testing of Springs, Testing of Ropes, Testing of Joints and Connections, Testing of Structures, Testing of Repaired and Strengthened Elements.

CES 625 Recycling and Reuse of Wastes in Construction Fields

Environmental Effects of Recycled and Reused Wastes in Construction, Classification of Recycled and Reused Wastes (Construction Wastes, Industrial By-Products, Agricultural Wastes, Rubber Tires, Glass, Plastics, etc…), Methods of Recycling, Properties and Testing of Reused and Recycled Materials, Properties and Testing of Concretes and Other Construction Materials Incorporating Reused and Recycled Wastes.

CES 626 Concrete for Special Applications

The Constituting Materials, Mix Design, Properties of Fresh and Hardened Concrete, Manufacture, Testing and Durability Aspects for Various Types of Concrete Made for Special Applications Such As: Concrete for Bridges, Concrete for Dams, Concrete for Nuclear Structures, Concrete for Underwater Construction, Concrete for Floors, Concrete for Tunnel Linings, Concrete for Bridge Decks, Concrete for Architectural Purposes.

CES 627 Durability of Construction Materials in Different Environments

Durability of Elements in a Structure From The Point of View of Materials Performance, Durability of Concrete Structures in Hot and Cold Climates, Design of Concrete Structures to Increase Durability, Durability of Concrete Structures in The Marine Environment, Durability of Steel Structures in Different Environments, The Durability of Masonry Construction, Durability of Brickwork and Blockwork, Durability of Timber in Construction, Durability of FRP Composites for Civil Works.

CES 628 Properties and Technology of Advanced Composite Materials

The Course Will Focus on The Materials, Production, Properties and The Technology Used for The Fiber Reinforced Polymers, Fibers, Types, Raw Materials, Manufacturing Process, Physical and Mechanical Properties, Fabrics, Types, Knitting, Weaving and Breading Techniques, Physical and Mechanical Properties of Fabrics, Resins, Types, Raw Materials, Manufacturing Process, Physical and Mechanical Properties, Uses and Limitations, Production Techniques of FRP Sections, Materials Used, Advantages and Disadvantages, Design of FRP Laminates, Stress-Strain Relation, Mixing Rule and Inverse Mixing Rule, Physical and Mechanical Properties of Laminates and Plates.

CES 629 Fracture Mechanics in Fatigue Analysis

Cyclic Stresses, Crack Initiation and Propagation, Crack Growth Behavior of Metals, Factors That Affect Fatigue Life, Fatigue Strength of Welded Structural Elements, Fatigue Crack Growth Testing

CES 630 Non-Linear Analysis of Concrete Structures

Limit Analysis, Rotation Characteristics, Plastic Analysis, Yield Line Theory of Plates, Creep and Shrinkage Effects, Serviceability Limit States, Constitutive Relations of Concrete and Reinforcement Materials.

CES 631 High Rise Buildings

Introduction, Earthquake and Wind Loads, Different Structural Systems of High-Rise Buildings, Structural Analysis of Frames and/or Shear Walls, Closed and Open Concrete Core Systems, Tube Systems, Torsional Effect, Special Topics and Applications, and Coupled Shear Walls.

CES 632 Advanced Analysis of Special Concrete Structures

The course introduces the Design of Reinforced and Prestressed Concrete Structures Using The Strut and Tie Method. Design Applications Include Deep Beams, Corbels, Flat Slabs and Shallow Beams with D-Regions, Openings in Beams, D-Regions in Prestressed Beams, Structural Joints in Bridges and Pre-Cast Beams and Slabs.

CES 633 Membrane Concrete Structures

Membrane Theory, Bending Theory, Double Curved Shell, Shells of Positive and Negative Gaussian Curvatures, Cylindrical Shells, Composite Shells, Suspended Roofs

CES 634 Behavior and Design of Masonry Structures

Introduction: Masonary Elements, Structural Design, Types of Construction and Planning The Building, Properties of Masonary Materials: Definitions, Masonary Units, Masonary Mortar, Grout and Reinforcement, Behavior of Masonary Assemblings Under Axial Compression, Shear and Bending, Reinforced Beams and Lintels: Flexural Behavior and Design – Shear Behavior and Design, Flexural Walls: Behavior, Analysis and Design of Unreinforced and Reinforced Walls, Loadbearing Walls: Flexural Behavior and Design – Shear Behavior and Design, Shear Walls: Flexural Behavior and Design – Shear Behavior and Design.

CES 640 Advanced Soil Mechanics

Concept of Effective Stress, Clay Mineralogy and Clay-Water Relationships, Soil Compressibility and Theories of Consolidation, Creep Behavior of Soils, Pore Water Pressure Parameters, Strength of Granular and Cohesive Soils, Stress-Strain Relationships for Soils, Mechanics of Unsaturated Soils, Concept of Stress Path and Soil Behavior, Soil Plasticity, Critical State Soil Mechanics.

CES 641 Underground Structures

Classification of Underground Structures, Tunneling Technologies for Soils and Rocks, Tunneling-Induced Stresses and Displacement Fields, Classification of Tunnel Lining Systems, Soil-Lining Interaction and Lining Design, Geotechnical Instrumentation of Underground Structures.

CES 642 Soil Dynamics

Fundamentals of Vibration, Wave Propagation and Soil Dynamics, Determination of Dynamic Soil Properties Using Laboratory and Field Tests, Geotechnical Earthquake Engineering, Liquefaction Theory and Mitigation Techniques, Fundamentals of Vibrations, Wave Propagation and Soil Dynamics, Determination of Dynamic Soil Properties Using Laboratory and Field Tests, Geotechnical Earthquake Engineering, Liquefaction Theory and Mitigation Techniques.

CES 643 Numerical Modeling in Geomechanical Engineering

Theory and Application of The Finite Difference Method, Formulation and Application of The Finite Element Method, Incorporation of Non-Linear Behavior and Soil Plasticity in Numerical Modeling, Use of Some Computer Packages for Geotechnical Numerical Analysis.

CES 644 Rock Engineering

Geological Aspects of Rock Engineering, Engineering Properties and Classification of Intact Rocks, Rocks Discontinuities and Rock Masses, Rock Foundations, Rock Socketed Piles, Stability of Rock Slopes, Underground Rock Excavations.

CES 645 Special Topics in Geotechnical Engineering

Problematic Soils Classification and Identification, Engineering Behavior of Expansive, Collapsible, and Highly Compressible Soils, Treatment and Foundations on Problematic Soils, Dewatering in Civil Engineering Projects, Hydraulics of Deep Wells, Design of Soil Filters and Filter Fabric.

CES 650 Stability of Plane Frameworks

Stability of Structural Members, The Stability Function, The Concept of Determination The Elastic Critical Load, Sway and No-Sway Buckling Loads of Isolated Systems, Multi-Story Frames, Multi-Bay Frames, Braced Frames, Non-Rectangular Frames, Rigidly-Jointed Trusses, Determination of Inelastic Critical Buckling Loads, Code Provisions, Applications, Stability Programming for Structures.

CES 651 Advanced Design of Steel Bridges (2)

Modern Trends in The Design and Construction of Steel Bridges, Analysis and Design of Arch Bridges, Analysis and Design of Box Girder Bridges, Analysis and Design of Suspension Bridges and Cable-Stayed Bridges.

CES 653 Special Steel Structures (2)

Special High Rise Building, High Pressure Steel Tanks, Space Steel Structures, Transmission Towers, Pre-Stressed Steel Structures, Introduction to Offshore Structures.

CES 654 Behavior of Steel Structures (2)

Critical Evaluation of The Actual Behavior of Steel Connections, Members and Structures Significance of This Behavior in Terms of Design, Development of Design Specifications, Comparison Between Different International Codes.

CES 655 Design of Steel Transmission and Antenna Towers (2)

Types of Transmission and Antenna Towers, Loads, Cases of Loading, Effect of Cables, Emergency Status, Diaphragms, Design of Elements, Different Codes

CES 656 Thin Walled Steel Structures (2)

Stability of Plates and Thin Elements Under Different Stresses and Conditions, Studying The Post Buckling Behavior of Plates, Effect of Local Plate Buckling of Thin Walled Sections on The Overall Stability of The Member, Design of Cold Formed Members to Resist Axial Tension, Axial Compression, Simple Bending and Combined Action of Axial Force and Bending Moment.

CES 657 Design of Offshore Structures

Types of Off Shore Structures, Loads: Wind, Wave, Current and Earthquakes, Wave Theories Validation Limits, Morison Equation and Its Applications, Codes Used in Design, Types of Connections.

CES 658 Design of Space Steel Structures

Development of Different Types of Steel Double Layer Grids, Space Roof Trusses, Tall Buildings, Structural Systems to Resist Gravity and Lateral Loads, Energy Dissipation Systems, Cable Supported Structures.

CES 659 Engineering Economics

Time Value of Money, Simple and Compound Interest, Equivalence, Economic Feasibility Study of Projects, Financial Analysis, Sources of Funding, Cost Analysis, Break-Even and Optimization Analysis, Project Selection Based on Comparison of Economic Performance and Indicators.

CES 660 Resources Management

Material Management, Human Resources Management, Site Management, Information System, Team Organization, Recruiting and Training, Incentives, Labor Relation, Costs, Reporting.

CES 661 System Analysis for Civil Engineering

System Analysis Approach, Resource Allocation and Mathematical Models, Optimization Methods, Decision Analysis, Economic Considerations for Resource Constraints and Unit Costs.

CES 662 Accounting and Costing

Basis and Principles of Accounting, Accounting Systems, Accounting of Construction Projects, Planning and Finance, Costing, Costing Elements, Benefit.

CES 663 Productivity in Construction

Factors Affecting Productivity, Productivity Engineering and Management, Productivity Measurement, Work Study, Method Study, Total Productivity, Productivity Improvement Techniques.

CES 664 Construction Management (2)

A Comprehensive Understanding of The Construction Industry Worldwide, Feasibility Studies, Organization for Construction, Concepts of Leadership, Team Building, Conflict Management, Meetings, Presentations, and Proposals, Management of Information.

CES 665 Risk and Safety Management

Risk Management During Construction Project Life, Risk Analysis, Risk Evaluation, Risk Assessment, Risk Prevention in The Construction Projects, Safety and Health Considerations on Construction Project, Safety Regulations and Safety Management.

CES 666 Operations Research and Value Engineering

Value Engineering Concepts, Function Analysis System Techniques, Creativity, Matrix Evaluation, Design-To-Cost, Life Cycle Costing, Human Relations and Strategies for Organizing, Performing and Implementing Value Engineering.

CES 667 Information Management System

Database Management, Overview of Information Management, Decision Support Systems, Analysis and Modeling Techniques, In-Service M&E, Performance Modeling and Failure Analysis, The Use of Information in Organizations, The Management of The Information Resource, The Impact of Information and Communication Technology.

CES 668 Environmental Management

Technical, Economic, Political, Administrative, and Social Forces Influencing The Quality of The Environment and The Use of Resources, Existing and Pending Pertinent Legislation, Government and Industrial Programs to Combat Pollution of The Air, Soil, and Water, Theoretical Aspects of Specific Management Problems.

CES 669 Special Topics in Construction Engineering

Various Studies in Construction Engineering to Follow New Developments in The Field.

CES 670 Advanced Topics in Construction Engineering

Advanced Topics Selected From The Areas of Construction Engineering to Provide The Students with Recent Developments.

CES 672 Construction Systems and Methods

Construction Details, Manufacture, Fabrication, and Erection of Special Structures: High Rise Buildings, Wide Span Structures, Underground Buildings, Large Scale Projects, Specialized Buildings, Formwork Systems, Construction Techniques, Deep Excavation, and Dewatering Systems.

CES 673 Construction of Temporary Works

Introduction to The Importance and Types of Temporary Works in Construction Projects, Design Aspects of Temporary Works, Formwork, Scaffolding, Costing of Temporary Works, Safety Aspects and Requirements, False Works in Construction Projects.

CES 674 Use of Fiber Reinforced Polymers (FRP) Materials in Reinforced Concrete Structures

Types and Properties of FRPs, Toughness of Advanced Composites, Applications on The Use of FRP Materials in Flexure and Shear Strengthening of R.C. Beams, Strengthening of R.C. Columns, Strengthening of R.C. Slabs and Walls, Methods for Ductility Calculations, Use of FRP Materials As Internal Conventional or Prestressed Reinforcement, Design Methods and Applications on The Use of Advanced Composites in RC Structures.

CES 675 Fire Protection of Structures

Definitions, Used Engineering Terminologies, Egyptian Codes, Fire Protection Requirements for Structures and Individuals, Properties of Materials and Standard Tests Under The Effect

of Fire, Design of RC Structures to Resist Fire and Design of Steel and Composite Structures to Resist Fire.

CES 676 Use of High – Strength Concrete in RC Structures

Definition of High – Strength Concrete, Selection of Materials and Concrete Mix Proportions, Mix Preparation and Quality Control, Properties of High – Strength Concrete, Structural Design Considerations for High – Strength RC Structures Such As Concentric and Eccentric Columns As Well As Beams and Slabs, Economic Considerations and Applications.

Ces 677 Advanced Prestressed Concrete

Types of Prestressed Systems in Slabs and Beams, Prestressing Using FRP Tendons, Behavior of Unbonded Prestressed Concrete Beams in Flexure and Shear and Deflection of Unbonded Prestressed Concrete.

CES 680 Earthquake Hazard Assessment

World Seismicity, Plate Tectonics, Elastic Rebound, Source Mechanisms, Travel Path and Attenuation, Comparison of Attenuation Relationships, Site Effects, Probabilistic and Deterministic Seismic Hazard Assessment, Selection and Scaling of Earthquake Records, Natural and Artificial Earthquake Records, Models, Methods and Programs for Synthetic Ground Motion, Features of Ground Motion Affecting Seismic Response.

CES 681 Uncertainty Modeling in Earthquake Losses

Approaches for Uncertainty Modeling and Components of The Procedures, Uncertainty Models in Source, Path and Site Response, Uncertainty in Structural Response, Uncertainty Models for Inventory and Loss Functions, Component and System Uncertainty, Requirements for Probabilistic Loss Assessment From Source to Society.

CES 682 Earthquake Structural Dynamics

SDOF and MDOF Systems, Free and Forced Vibrations, Duhamel Integral, Spectra and Their Applications, Damping Models and Representation, Vibration Measurements Devices, Modal Analysis, Response History Analysis, Numerical Integration of Equations of Motion, Approximate Solutions, Computer Applications.

CES 683 Earthquake Soil Dynamics

SDOF and MDOF Systems, Free and Forced Vibrations, Dynamic Soil Properties, Strain Rate Effects, Dynamic Modeling of Soil, Saturation and Drainage Conditions, Site Investigations.

CES 684 Advanced Numerical Analysis

Introduction to Concept of Discretization, Simple Finite Elements Formulation, Load and Boundary Condition Modeling, Numerical Integration, Reduce Integration and Effect on Element Deformation, Finite Element Analysis for Inelastic and Nonlinear Problems, Finite Element Analysis in Dynamics, Frequency and Time Domain Solutions, Introduction to Software Packages.

CES 685 Earthquake Assessment and Design of Buildings and Bridges

Forms of Buildings, Structural System Configurations, Regularity Indices, Irregularity and 3D Effects, Overview of Steel, Concrete and Masonry Building Response and Basis of Design, Local Member Response and Relationship to Global System Ductility, Basic Code Approach to Force and Deformation Calculations, Application of Modal and Response-History Methods, Methods of Assessment, Local and Global Force, Deformation and Ductility Capacity, Detailing for Ductility, Forms of Bridges and Scope (Mainly RC Bridges), Configurations for Foundations, Lateral Load Resisting Systems, Pier-Deck Connection, Deck Section, Abutment and Abutment-Deck Connections, Curved and Skewed Bridges, Detailing of Bridge Members, Complex Input and Response in 3D, Fixed and Isolated Bridges, Design of Abutments, Piers, Connections and Foundations, Synchronous and Asynchronous Motion, Input Motion Forms for Extended Bridges.

CES 686 Geotechnical Earthquake Engineering

One, Two and Three Dimensional Site Response Analysis, Elastic and Inelastic Site Response, Liquefaction Causes and Effects, Models for Liquefaction, Large and Permanent Ground Deformations, Effect of Ground Relief, Dynamic Slope Stability, Soil-Structure Interaction Effects, Kinematic Interaction and Radiation Damping At Foundation-Soil Interface.

CES 687 Engineering Fragility Analysis

Probabilistic and Deterministic Assessment Methods, Options for Fragility Analysis, Simulation Options, Monte Carlo, Response Surface and Other Reduced Simulation Approaches, Random Fields Selection, Evaluation of Limit States, Analysis Methods for Supply and Demand Assessment, Statistical Treatment of Output, Generation of Fragility Functions, Assessment of Uncertainty.

CES 688 Network Performance Assessment

Generic Network Models, Mathematical Models for Networks, Measures of Network Performance, Static and Dynamic Flow Models for Networks, Earthquake Demand and Supply Consideration, Network Interactions and Joint Fragilities, Direct and Indirect Earthquake Effects, Optimization Techniques and Retrofitting-Hardening of Networks.

CES 689 Information Technology Implementation and Grid Technology

Data and Metadata Models, Visualization of Loss Data, Distributed Software Architecture, Integration of Loss Assessment Components.

CES 690 Inventory Technologies and Data Management

Introduction to Spatial Analysis Techniques, Conventional and Innovative Methods of Inventory Data Collection and Manipulation, Use of Satellite Imaging and Inferential Techniques, Genetic Based Models for Inventory and Training, Reliability of Inventory Data, GIS Systems for Risk Assessment.

CES 691 Social and Economic Impact Analysis

Characteristics of Complex Societal Systems, Economic Characteristics and Measures, Components of Social and Economic Fragility Analysis, Indices for Social and Economic Impact, Formulation of Social and Economic Loss Models, Examples.

CES 692 Decision-Making Methodologies

Decision Making and Relationship with Organizational Structure, Types of Organization and Management-Decision Models, Decision Making Theories, Multi-Attribute Decision Theory, Integration of Decision Theory and Options for Mitigation.

CES 693 Mitigation of Earthquake Losses – Engineering Action

Criteria for Repair and Retrofitting of Buildings and Bridges, Definition and Intervention Objectives, Limit States, Technology of Repair of Steel, Concrete and Masonry Buildings, and Steel and Concrete Bridges, Assessment of Success of Intervention, Example Applications From Practice.

CES 694 Mitigation of Earthquake Losses – Socio-Economic Action

Means of Intervention to Reduce Social and Economic Impact, Awareness and Outreach, Measures of Success of Outreach Efforts, Public Policy Organizations and Means of Affecting Public Policy, Land Use Management As a Means of Intervention to Reduce Losses, Issues of Urban Planning.

CES 695 Comprehensive Project – 'From Source to Society'

Contributed of Each and Every Subject From The Above List, to Take an Earthquake Scenario From its Source to The Estimation of Losses, Assessment of Intervention Options and Decision Making.

CES 696 Loss Assessment Software and Grid Technology

Basis and Use of Open Source and Proprietary Loss Assessment Software, Data Structures and Metadata Models, Communication of Information In a Grid Environment, Issues of Authentication and Access Control, Components of Loss Assessment Software, Software Architecture for Loss Assessment Modeling, Example Application of Loss Assessment Software Packages, Training in Use.

CES P98 Project (1)

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work with Complete Analysis in Topic Relevant to The Diploma Field of Study.

CES P99 Project (2)

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work with Complete Analysis in Topic Relevant to The Diploma Field of Study.

3. Department of Irrigation and Hydraulics

CEI 501 Hydrodynamics

Equations for Conservation of Mass, Energy, Momentum, Vorticity and Circulation, Stream Function, Velocity Potentials, Basic Flow Fields, Combining Flows by Superposition, Flow Net, Free Streamline Application, Gravity Effects, Introduction to Wave Motion, Computer Applications.

CEI 502 Hydraulic Engineering

Introduction: an Overview of Hydraulic Engineering and Historical Perspectives, Pipelines: Hydraulics of Steady Flow in Closed Conduits and Hydraulics of Unsteady Flow in Pipes Review of Steady Flow in Open Channels, General Introduction to Mechanics of Sediment Transport, Hydraulic Structures, Dam Appurtenances, Pump Intake Structures Culvert Hydraulics, Bridge Hydraulics, Physical Modeling: Similitude and Modeling Laws, Application of Modeling Laws and The River Models, Computer Applications.

CEI 503 Open Channel Flow (1)

Steady Flow in Open Channels: Resistance and Manning Equation, Specific Energy and Critical Depths, Hydraulic Jump, Gradually Varied Flow, Additional Transition Consideration and Flow Measurements, Unsteady Free Surface Flows: Definitions, Governing Equations and Applications, Computer Applications.

CEI 504 Sediment Transport (1)

Introduction, Hydraulic Properties of Sediments, Modes of Sediment Transportation Movement of Sediment in The Bed, Suspended Sediment Load, Total Sediment Load, Bed Geometry and Flow Resistance, Stable Channels, Computer Applications.

CEI 505 Hydraulics of Pipelines

Mechanics of Liquid Flow in Pipes and Pipe Networks, Pipe Transmission and Distribution Including Flow Control, Flow Measurements, Steady and Unsteady Flow, Surge and Water Hammer Problems, Pump Selection, Cavitation, Computer Applications.

CEI 506 Engineering Hydrology (1)

Introduction, The Hydrologic Cycle, Hydrologic Measurements, Engineering Applications for: Precipitation, Infiltration, Stream Flow, Flood Routing, Reservoir Yield, Evaporation, Groundwater, Flood Protection Works, Statistical Methods in Hydrology for Selection of Design Parameters and Hydrologic Analysis (Hydro-Graphs, Unit Hydro-Graph Routing).

CEI 507 Groundwater Hydrology (1)

Hydrologic Cycle, Groundwater Resources, Groundwater Movement, Well Hydraulics, Water Wells, Groundwater Fluctuations, Groundwater Management, Artificial Recharge, Salt Water Intrusion for Coastal Aquifers, Flow of Fluids in Porous Media, Anisotropy, Solution of Steady State Problems by Mathematical Analysis and Models, Analogs, Dupuit-Forchheimer Assumptions Method of Images, Boussinisq's Equation for Transient Problems, Solution by Laplace Transform, Seepage Under Dams, Water Quality Standards, Transport Processes

(Non-Reactive and Reactive Constituents) Hydrodynamic Equations for Advection and Diffusion in Saturated and Unsaturated Media Hydro-Chemical Behavior of Contaminants, Measurement of Parameters, Sources of Contamination, Remediation Measures.

CEI 508 Surface Water Hydrology (1)

Hydrologic Cycle, Data for The Hydrologic Analysis, Determination of Runoff from Precipitation, Determination of Peak Rates of Runoff, Hydro-Graphs, Reservoir Regulation, Surface Drainage, Field Applications and Hydrologic Considerations.

CEI 509 Water Resources Engineering

Hydrologic Cycle in Terms of Water Quantity (Quality, and Management), Hydrology of Flowing Water, Hydrology of Ground Water, Water Quality of Flowing Water and Ground Water, Hydrology of Impounded Water, Water Quality of Impounded Water, Water Resources Management, Assessment of Water Policy, Flood Hydrology, Types of Floods, Elements of Flood Computations, Water Detention/Retention Methods, Flood Confinement, Flood Control Measures, Economics of Flood Control.

CEI 510 Information Systems and Water Resources Management (1)

Introduction to Water Resources Planning and Analysis, Identification and Evaluation of Water Management Plans, Water Resources Planning Under Uncertainty, Water Resources Planning Objectives, Efficient Resource Allocation, System Analysis and Mathematical Optimization, Structuring and Solution of Mathematical Programming Model, Introduction to Information Systems, Recent Technologies and Data Processing, Introduction to Geographic Information Systems in Water Resources, Mathematical Models and Software Used for Analysis, Importance of Information Systems for Water Resources Management and Irrigation Management, Methods of Data Processing, Use of Some Software for Data Entry Organization, Preparation, Transferring Data Into Information, Mathematical and Engineering Formulation of The Problems, Determining Goals, Alternatives, Criteria for Decisions, Databases, Introduction to Geographic Information Systems, Decision Support Systems for Irrigation Management.

CEI 511 Irrigation and Drainage Engineering

Definitions and Basic Information, Soil Moisture Water Movement- Water Requirement Calculations, Methods of Surface Irrigation, Sprinkler Irrigation System, Drip Irrigation System, Planning and Design of Irrigation Networks, Irrigation System in Egypt, Water Measurements, Groundwater, Investigations of Drainage Projects and Reclamation of Saline Soils, Open Drains, Tile Drains.

CEI 512 Advanced Irrigation and Drainage Engineering (1)

Relation Between Plants, Soil, Water, Productivity and Environment, Modern Principles for Water Distribution, Modern Principles for Water Control- Automatic Control: Theory and Selection, Mass Balance Calculations, Geographic Information Systems and Estimating Water Requirements, Future of The Irrigation System in Egypt, National Plan to Improve Performance of Irrigation Systems, Design and Planning of Drainage Networks for Different Purposes, Principles of Reclaiming Acidic and Alkaline Soils, Recent Technology and Construction of Subsurface Drainage Systems and Their Maintenance, Environmental Issues

and Agricultural Drainage, Drainage Water Reuse for Irrigation and Limitations, Economics of Drainage Projects Performance of Drainage Systems.

CEI 513 Modern Irrigation Systems and Management and Maintenance of Irrigation Projects

Introduction for Mechanized Irrigation Systems, Specific Attributes and Limitations of Sprinkler and Drip Irrigation Systems, Soil Water and Salt Regime, Components of Sprinkler Irrigation Systems, Sprinkler System Design, Components of Drip Irrigation Systems, Drip System Design, System Maintenance and Evaluation, Practical Applications, Examples, Operation and Control Concepts, Management of Irrigation Projects, Methods of Estimating Water Requirements, Discharge Measurements, General Maintenance and Monitoring Methods, Sustainability of Irrigation Projects, Performance Measures, Examples and Applications.

CEI 514 Hydraulic Structures (1)

Classification and Function of Hydraulic Structures, Dams, Design and Stability Analysis of Gravity Dams, Intakes, Spillways, Control Structures, Stilling Basin Design, Advanced Topics in Channel Design, Coastal Structures, Aspects of Theory and Design Storage Dams, Outlet Works, Gates and Valves, Diversion Works, Drop Structures Conveyance and Control Structures, Culverts, Flownets, Seepage Control in Earth Structures, Principles of Project Planning, Methods of Analysis and Hydraulic Design of Storage Systems, Power Projects, Flood Control Projects, Pipeline Networks.

CEI 515 Dams Engineering (1)

Plan Formulation, Environmental Considerations, Flood Hydrology Studies, Selection of Type of Dam, Foundations and Construction Materials, Earth Dams, Concrete Gravity Dams, Aspects of Design, Analysis of Seepage and Reduction Measures Including Grouting, Design of Filters Determination of Slope Stability, Construction Aspects.

CEI 516 Coastal and Harbour Engineering

Historical Background of Coastal Engineering, Wind Waves and Swells, Long Period Sea Waves, Near-Shore Currents, Coastal Sediment, Field Survey, Beach Erosion Control, Coastal Dikes and Sea-Walls, Groin Systems, Detached Breakwater, Artificial Nourishment Works, Pollution Problems in The Near-Shore Area, Pollution Control, Near Shore Area Development, Shoreline Changes Modeling, Harbor and Marine Structures, Laboratory Model, Waves, Planning of Ports, Planning of Coastal Engineering Structures, Terminals.

CEI 517 Ocean Wave Mechanics and Basics of Shore Changes Processes

Wind, Tides, Currents, Wave Theory and Application to Engineering Problems, Linear and Non-Linear Theories of Regular Gravity Waves, Wave Properties and Transformation in Shoaling Waters, Wave Action on Walls and Piles, Wave Statistics, Wave Forces on Structures, Spectral Analysis of Regular Waves.

Coastal Sand Transport, Radiation Stress and Its Components, Wave Set-Up, Radiation Shear Stress Gradient, Near-Shore Currents, Cross-Shore Sediment Transport, Long-Shore Sediment Transport, Mud Coasts, Formation, Deltas, Early Coastal Transport Formulas, Coastal Changes with Single Line Theory, Coastal Protection Structures.

CEI 518 Inland Navigation

Types of Navigation Channels, Inland Ports, Ship Characteristics, Ship Movements Hydraulic Phenomena, Ship-Induced Water Motion, Design of Water Section, Side Slopes Revetments, Depth of Channels, Units Towing, Maneuverability At Low Speed Design of Curves, River Training, Navigation Aids, Mooring Accessories, Dredging, Sounding, Navigation Locks, Bridges.

CEI 519 Water Environment Engineering and Water Quality

Ecosystem, Wetlands, Treatment Processes, Basic Fluid Principles, Mass Balance, Sedimentation Principle, Water Quality Parameters, Sources of Water Pollution, Stream Pollution Modeling, Water Treatment, Waste Water Treatment, Modeling of Pollutants in Water Channels and in Ground Water, Mathematical and Computer Applications.

CEI 520 Environmental Impact Assessment of Water Resources Projects

Terminology, Planning and Management of Impact Studies, Simple Methods of Impact Identification, Environmental Indicators and Indices, Prediction and Assessment of Impacts on Surface and Ground Water Environments, Environmental Monitoring, Major Water Resources Projects in Egypt and Their Impacts.

CEI 521 Coastal Environment Engineering

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 on The Coast, Dredging Operations, Coastal Water Management, Management of Coastal Sediments, Coastal Hazard.
Climatic Changes, Reasons, Impact on Different Fields, Expected Impact on Water Sources, Water Requirement in Egypt, Level of Mediterranean Sea

CEI 522 Topics in Water Resources Management and Environment

Selected Topics in The Field of Water Resources Engineering, The Course Title and Outline of What Is Required Will Be Submitted Before The Students Register for The Course, a Copy of This Information Will Be Placed in The Student File.

CEI 523 Topics in Hydraulics Engineering and Water Structures

Selected Topics in The Field of Hydraulics, The Course Title and Outline of What Is Required Will Be Submitted Before The Students Register for The Course, a Copy of This Information Will Be Placed in The Student File.

CEI 524 Topics in Irrigation and Drainage Engineering

Selected Topics in The Field of Irrigation and Drainage, The Course Title and Outline of What Is Required Will Be Submitted Before The Students Register for The Course, a Copy of This Information Will Be Placed in The Student File.

CEI 525 Topics in Harbour and Coastal Engineering

Selected Topics in The Field of Harbour and Coastal Protection and Inland Navigation Engineering, The Course Title and Outline of What Is Required Will Be Submitted Before

The Students Register for The Course, a Copy of This Information Will Be Placed in The Student File.

CEI 526 Project

CEI 527 Basics of Water Quality

Hydrologic Cycle and Water Availability, Water Chemistry, Standards of Water Supplies for Different Uses, Types and Sources of Water Pollution, Sampling and Testing, Assessment of Water Quality, Water Quality Monitoring and Management, Simulation of Surface and Ground Water Pollution, Application on Computer Programs, Field and Laboratory Measurements.

CEI 528 Experimental Fluid Mechanics

Theoretical Background for Fluid Mechanics and Measurements, Range of Variables, Scientific Approach and Types and Sources of Errors in Measurements, Standardization and Devises' Calibration- Measurements of Fluid Properties (Density, Viscosity, Surface Tension, Thermal Conductivity, Electrical Conductivity), Static Pressure, Pressure Measuring Devices, Pressure Measurements, Measurement of Velocity Using Pitot Tubes and Current Meters, Instrumentation and Recent Technology.

CEI 529 Hydrometry (1)

Field Measurements, International Standards in Field Measurements, Laboratory Calibration of Field Measuring Devices, Metrological Measurements (Temperature, Humidity, Wind Speed, Rainwater Depth), Instrumentation, Stream Measurements (Discharge, Velocity, Levels), Relations Between Discharge, Velocity, and Levels.

CEI 530 Engineering Hydraulics Laboratory (1)

Dimensional Analysis, Similarity Laws, Hydraulic Simulation, Theoretical Background for Fluid Dynamics, Laboratory Experiments and Demonstration of Flow Measurements, and Recent Technology, Measurement of Pipe Discharge (Orifice Meter, Venturi Meter), Measurement of Pipe Velocity, Measurement of Pipe Pressure, Laboratory Experiments (Flow Through Orifices, Under Pressure Flow, Flow Through Venturi Meter, Notches and Weirs, Uniform Flow in Open Channels, Calibration of Gates, Characteristics of Hydraulic Jump).

CEI 531 Advanced Drainage Engineering

Theoretical Background, Measures and Parameters of Ground Water Table, Effect of Drainage on Agricultural Process, Design and Planning of Drainage Networks for Different Purposes, Cases of Drainage Discharge Calculations, Drainage Field Measurements, Principles of Reclaiming Acidic and Alkaline Soils, Recent Technology and Construction of Subsurface Drainage Systems and Their Maintenance, Drainage Water Reuse Limitations, Economics of Drainage Projects, Performance Indicators of Drainage Systems.

CEI 532 Pump Station Engineering

Station Configuration and Design (Sump, Suction Pipes, Entry Valves and Special Pieces, Exit Valves and Special Pieces, Header, Pump Safety Devices, Pump Types, Pump Systems, Pump Selection, Flow and Pressure Measurements.

CEI 533 Management and Maintenance of Irrigation Systems

Operation and Control Concepts, Effect of Type of Irrigation System on Operation, BMS, Setting of Management Objectives and Performance Indicators, Standard Methods for Measuring of Performance Indicators, Field and Laboratory Measurements, System Maintenance (Regular Check Schedules, Discharge and Pressure Measurements), Pump Station Maintenance and Check Schedules (Electromechanical Parts, Civil Parts), Sustainability and Durability of Irrigation Projects, Performance Measures with Time.

CEI 601 Advanced Fluid Mechanics

Fundamentals of Fluid Motion: Kinematics, Lagrangian Formulation, Eulerian Formulation, Conservation of Mass and Flow Mapping, Dynamics of Non-Viscous Fluid Motion: Lagrangian and Eulerian Equations of Motion, Irrotational Motion of an Incompressible Fluid Foundations for Analysis of Viscous Fluid Motion, Boundary Layer Theory, Laminar Flow, Turbulent Flow, Hydrodynamics, Laminar Boundary Layer, Turbulent Boundary Layer.

CEI 602 Topics in Fluid Mechanics and Hydraulics

Selected Topics in The Fields of Fluid Mechanics and Hydraulics, The Course Title and Outline of What Is Required Will Be Submitted Before The Students Register for The Course, a Copy of This Information Will Be Placed in The Student File.

CEI 603 Advanced Hydraulics

Advanced Methods of Analyzing Hydraulics and Water Resources Systems, Computation of Unsteady Flow in Open Channels, Abrupt Waves, Flood Waves, Tidal Propagation Method of Characteristics, Mathematical Modeling of River and Coastal Currents, Modern Concepts of Control Volume and Laminar, Turbulent Flows.

CEI 604 Open Channel Flow (2)

Revision of Basic Equations, Rapidly Varied Flow, Drops and Hydraulic Jump in Nonprismatic and Sloping Channels, Design of Stilling Basins, Sub-Critical Flow in Curves High Velocity Flow, Gradually Varied Flow in Regular and Natural Channels, Unsteady Free Surface Flows, Spatially Varied Flow, Air Entrained Flow, Computer Applications.

CEI 605 Hydraulic and Environmental Modeling

Review of Similarity Mechanics and Model Laws, River Models for Transport of Matter and Heat: Basic Concepts and 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, Computer Applications. Concepts of Mathematical Modeling and Simulation in Environmental and Water Resources Engineering, Simulation Techniques, Introduction to Stochastic Modeling, Time Series Analysis and Synthesis, Application for Some Situations Using Available Software.

CEI 606 Sediment Transport (2)

Regime Approach, Turbulent Theories, Suspended Sediment, Tractive Force Method, Bed Forms, Einstein Method, Modified Einstein Method, Reservoir Salutation, Recent Developments, Design of Mobile Bed Channels, Design of Sedimentation Basins, Channel

Degradation, Effect of Channel Obstructions and Contractions, Sediment Transport in Closed Conduit, Sediment Transport By Wind.

CEI 607 River Engineering

Open Channel Flow, Basic Principals, Natural Rivers, System in River Parameters Stream Forms, Channel Adjustment and River Metamorphosis, Hydraulic Relations for Alluvial Streams, Stage Discharge Predictors, Sediment Discharge Formulas, Sediment Measurements Techniques, Channel Stability, Regime Theory, River Training and Control Structures, River Stabilization, Bank Protection, Scour Around Bridge Piers Hydraulic and Environmental Effects of Highway Crossings and Large Dams on River.

CEI 608 Hydrologic Systems Analysis

Statistics and Probability Analysis of Hydrologic Data, Frequency Analysis, Regression and Correlation Analysis, Analysis of Variance, Covariance, Time Series, Sequential Generation of Hydrologic Information, Hydrologic Models, Processes and Systems Applications to Flood and Stream Flow Studies, Rainfall Studies, Stream Flow Studies Water Quality Studies, Water Wave Studies.

CEI 609 Engineering Hydrology (2)

Weather and Hydrology (General Circulation, Temperature, Humidity and Wind) Precipitation, Stream Flow, Evaporation and Transpiration, Subsurface Water, Stream Flow Hydro-Graphs, Relation Between Precipitation and Runoff, Hydrologic and Hydraulic Routing, Erosion and Sedimentation in River Basins, Deterministic Hydrologic Models Probability in Hydrology, Stochastic Hydrology, Hydrology and Water Quality.

CEI 610 Surface Water Hydrology (2)

Runoff Process, Time Distribution of Runoff, Hydro-Graph Analysis, The Unit Hydrograph, Conceptual Models for Determining Hydro-Graphs, Space Distribution of Runoff Stream Flow Measurements, Determining Peak Discharges, Flood Characteristics and Determination of Elevations, Discharge, Volume, Duration of Floods, Design Floods and Reservoirs.

CEI 611 Groundwater Hydrology (2)

Groundwater Resources, Groundwater Movement, Darcy's Law and Measurement of Permeability, Well Hydraulics, Groundwater Fluctuations, Groundwater Management, Conjunctive Use of Surface Water and Groundwater, Artificial Recharge, Salt Water Intrusion, Flow in Fractured Rocks, Thermal Reservoirs, Flow in The Unsaturated Zone, Multiphase Flow in Porous Media, Quality of Ground Water.

CEI 612 Management and Economics of Water Resources

Review of Water Resources Management Techniques, Case Studies and Their Applications to Local Conditions, Identification of Major Problems, Implications of Development Alternatives, Legal, Environment, Economical and Social Aspects, Structuring and Solution of Mathematical Models, Decision Analysis, System Simulation, Application of System Analysis Techniques to The Solution of Civil Engineering Problems, Principles of Engineering Economics, Mathematics of Economic Analysis: Defining Alternatives, Discounting Factors and Discounting Techniques and Efficient Resource Allocation, Benefit-Cost Analysis: Project Evaluation, Feasibility Tests, Defining Benefits and Costs, Categories, Measurements of Benefit-Cost, Benefit Cost Variations and Examples for Different Cases.

CEI 613 Information Systems and Water Resources Management (2)

Nile Evolution, Flows, Water Uses, Global Climate Change and The Nile Basin, Hydrological Data Requirements for Planning Nile Management Future Irrigation Planning in Egypt, Future Water Development Plans of The Nile, Determining Goals, Alternatives, Criteria for Decisions, Databases, Decision Support Systems for Water Resources Planning and Analysis, Examples, Applications.

CEI 614 Advanced Irrigation and Drainage Engineering (2)

Water Requirement Calculations and Selecting Optimum Cropping Pattern, Water Balance and Resource Allocation, Water Quality and Tolerance for Different Crops, Salt Problems in Irrigated Agriculture, Plant Response to Saline and Alkaline Soils, Reclamation of Salt Affected Soils, Monitoring and Evaluation of Irrigation Projects, Drainage and The Environment, Drainage Methods, Salinity and Alkalinity, Leaching Requirements and Salt Balance, Field and Laboratory Procedures for Determining Hydraulic Conductivity, Drainage Investigation Studies, Economics of Drainage Projects, Design and Construction of Drainage Systems, Operation and Maintenance of Drainage Systems Monitoring and Evaluation of Drainage Systems.

CEI 615 Hydraulic Structures (2)

Storage Structures, Dams and Reservoirs, Conveyance Structures, Energy Dissipation Structures, Flow Measurement Structures, Control Structures, Sediment and Chemical Control Structures, Collection and Diffusion Structures, Intakes, Surface Drainage Inlets, Spillways, Gates, Stilling Basins, Culverts, Flow Nets, Water Stabilization Structures, Navigation Locks.

CEI 616 Dams Engineering (2)

Rockfill Dams, Design Considerations, Settlement Calculations, High Aswan Dam, Reinforced Concrete Dams, Arch Dams, Aspects of Design, Stress Analysis, Plan Formulation, Earthquake Response, Construction Aspects, Design of Spillways, Design of Stilling Basins.

CEI 617 Tunnels Engineering

Introduction and History of Tunnels, Use of Tunnels in Water Works, Classification of Tunnels, Main Elements in Alignment and Design of Tunnels, Field Investigations and Soil Tests Tunneling Methods, Ground Treatment in Tunneling, Support of Tunnels, Stresses and Displacements Associated with Excavation of Tunnels, Design of Tunnels, Considerations in Civil Engineering, Design Methods: Soft Ground and Tunnel Design in Relation to Shield Loading and Ground Loading.

CEI 618 Pump Stations and Hydropower Engineering

Station Capacity, Inflow Hydro-Graph, Combined Flow Systems, Station Configuration and Design, Pump Systems, Pump Types, Pump Selection, High Static Head Systems, Large Pump Station Systems, Piping Systems, Fittings, Suction Piping Arrangements, Valves, Flow and Pressure Meters. Practical Approach in The Planning and Design of Water Power Installations, Fundamental Theory of Water Availability and Demand, Flow, Power and Load Duration Curves Classification of Power Sources, Project Planning: Economic and Financial

Analysis Including Coast and Benefits, Special Features of Hydro Plants, Plant Maintenance Operation and Appurtenances for Hydro Plants, Ecological Effects of Hydropower Facilities.

CEI 619 Wave Hydrodynamics

Natural Phenomena, Basic Equations of Wave Motion, Small Amplitude Wave Theory Finite Amplitude Wave Theory, Wave Transformation, Ocean Wave Characteristics, Wind Wave Generation Development and Prediction, Wave Action on Walls and Piles, Wave Pressure on Vertical Walls, Wave Forces on Structure, Theory of Long Period Wave, Oscillation in Lakes and Bays Tide, Storm Surge, Near-Shore Currents, Radiation Stress, Wave Set-Up Long-Shore Current, Rip Currents, Near-Shore Current System.

CEI 620 Sediment Process and Environmental Engineering in Coastal Zones

Transport Modes, Sediment Properties, Critical Bed Shear Stress, Bed Load Transportation, Coastal Sand Transport, Cross-Shore Sediment Transport, Long-Shore Sediment Transport, Mud Coasts, Coastal Formations, Deltas, Early Coastal Changes with Multiple Line Theory Inlet Stability, Beach Erosion Control, Storm Surge Countermeasures, 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 on The Coast Dredging Operations and Waste Disposal, Coastal Water Management, Management of Coastal Lands and Sediments, Management of Coastal Ecosystem, Coastal Hazard, Legal Issues in Environmental Engineering.

CEI 621 Port and Marine Structures

Breakwaters, Revetments, Sea-Walls, Groins, Jetties, Docks, Quay Walls Types of Ports, Site Selection, Port Planning, General Cargo Berths, Containers Terminals, Ferry Terminals, Liquid Bulk Terminals, Fenders, Access Channels Basins, Transit Sheds and Ware House.

CEI 622 Marine Offshore Structures

General Concept, Historical Review of Offshore Structures, Types of Offshore Structures, Fabrication and Installation of Offshore Platforms, Environmental Loading on Offshore Platforms, Wave Theories, Morison's Equation, Wave and Current Loading on Fixed Offshore Structures, Review of Wave and Current Loading in Offshore Codes, Modeling of Forces on Marine Offshore Structures, Case Histories of Offshore Platform Failure Due to Extreme Wave Loading, Scour Around Marine Structures, Some Aspects of Design and Analysis of Offshore Piles.

CEI 623 Stream Pollution Control

Water Quality Standards, Physical and Chemical Pollution, Bacterial Contamination of Surface Waters, Effects of Specific Types of Pollution Such As Thermal, Point and Non-Point Sources, Stream Self-Purification, Effects of Lake Eutrophication, Pollution Surveys and Methods of Control.

CEI 624 Numerical Models in Hydraulics and Water Resources

Review Methods and Strategies in Computational Hydraulics for The Solution of Algebraic Ordinary and Partial Differential Equations, Fundamentals and General Techniques Basic Elements of Numerical Modeling, Generation of Numerical Mode Ling, Relation Between

Physical and Numerical Modeling, Basic Numerical Concepts, One-Dimensional Diffusion Equation, Multi-Dimensional Diffusion Equation, Numerical Models in Different Fields (Pipe Networks, Open Channels, Ground Water, Hydrology), Application of Geographic Information Systems in Numerical Modeling, Analysis of Results of Application of Numerical Modeling.

CEI 625 Hydrometry (2)

Types of Measuring Structures, Design of Measuring Structures, Measuring Weirs, Calibration of Gates, Surveying of Cross Sections with Ultra Sonic Devices, Measurements Using Magnetic Field Devices, Laboratory Calibration, Instrumentation.

CEI 626 Engineering Hydraulics Laboratory (2)

Advanced Methods in Laboratory Measurements: Magnetic Profiler for Water Surface Profile, Hot Wire for Velocity Profile, LDA for Velocity Profile, Image, Video and Digital Tracing, Shear Stress Measurements, Hydraulic Force Measurements, Rough Bed Characteristics, Local Scour and Bed Configuration.

4. Department of Public Works

CEP 500 Modern Methods of Railway Stations Planning

Architectural, Aesthetic, Operational Requirements for Station Design –Railway Station Layout and Elements, Freight Station and Cranes Types, Locomotive, Stabling and Marshalling Yards Automization, How to Improve Urban (Underground Metro) and Rural Station Capacity.

CEP 502 Digital Terrain Models and Applications

Introduction to DTM, Methods of Creating DTM from Different Sources, e.g. Conventional Surveying, Aerial Photogrommetry, Satellite Imagery, Accuracy of DTM as a Function of The Used Data, Mathematical Models Used in DTM Creation, Identifications of DTM, Application of DTM in Surveying Projects, Computation of Cut and Fill, Planing of Highways and Irrigation Canals.

CEP 503 Non-Topographic Photogrammetric Surveying

Introduction to NTPS, Types of Analog and Digital Cameras Used in NTPS, Calibration of Cameras, 3D Computation from Close Range Photogrammetric Systems, Multi Station Close Range Photogrammetric Systems, Application of NTPS in Engineering and Non Engineering Projects, Application of NTPS in Mobile Mapping Systems (MMS).

CEP 504 Map Production

Introduction to Software Packages Used in Map Production, Techniques of Manipulating Raster Images, Radiometric and Geometric Correction of Raster Images, Raster to Vector and Its Errors, Production of Orthophoto: Methods Display Enhancement, Merging DTM with Digital Maps, Printing and Color Separation of Orthophoto, Printing and Manipulating Digital Maps.

CEP 505 Techniques for Surveying Data Collections

Kinds of Surveying Data, Different Methods of Collecting Surveying Data, Study of Computability and Homogeneously of Methods of Collecting Data, Data Preparation for Computer Handling, Data Storage on Computers, Methods of Data Recalling, Methods of Updating Data.

CEP 506 Cartography and Cadastral Surveying

Kinds of Cadastral Maps (Paper Copy and Digital Maps), Map Key and Arrangement of Maps, Design of Symbols and Features Library, Extraction of Maps with Different Scales from Surveying Data Collected from Cadastral Purposes, Relation Between The Cadastral Surveying and The Laws of Ownership and Heritage, Land Subdivision of Cities, Municipalities and Schist, Cultivated Land Subdivisions and Their Relations with Sources of Water Drainage Systems and Roads, Documentation for Ownership, Taxes and Land Registration.

CEP 507 Digital Mapping Technology

Introduction to Digital Mapping, Techniques of Creating and Updating 2D, 2.5D, and 3D Digital Maps and Its Link with Digital Topographic Databases (DTDB), Superimposition of

Digital Maps on Raster Imagery and Back Projection Techniques, Updating Geographic Information Systems (GIS) Using Digital Maps, Wide Area Digital Mapping Systems, Application of Digital Mapping in Navigation and Automatic Vehicle Location (AVL).

CEP 508 Digital Image Processing

Types of Digital Imagery, Radiometric and Geometric Corrections of Digital Imagery, Geore-Ferencing of Digital Imagery, Different Filtering, Sharpening and Enhancement, Information Extraction Techniques and Applications, Raster to Vector, Storage and Compression of Digital Imagery, Multi Resolution Digital Imagery Techniques.

CEP 509 Photo Interpretation

Principles and Applications of Photo Pattern Analysis, Geologic and Geomorphologic Patterns, Terrain Studies and Land Use Suitability and Capability Mapping, Energies of The Natural and Cultural Environment, Current Remote Sensing Systems and Histories of Applications in Measuring Environmental Energy, Information Environment, Land Information Systems (LIS), Methods of Photogrammetry and Digital Cartography, Photo Interpretation Applications in Urban Development, Dams, Construction Materials, Highway Engineering.

CEP 510 Geometric Geodesy

Overview of All Possible Geodetic Positioning Techniques, Establishment of First Order Geodetic Datum, Ellipsoid Geometry, Reduction of Terrain Measurements to The Ellipsoidal Surface, Coordinate Systems in Geodesy, Two- and Three-Dimensional Computations, Coordinate Computation in The Mapping Plane and Related Coordinate Transformations Between Different Involved Systems.

CEP 511 Adjusting Surveying Measurements

Review of The Theory of Errors, Review of Matrix Algebra, Univariate and Multi Variate Error Propagation, General Mode Model of Combined Least Squares Adjustments, Parametric and Condition Adjustments as Special Techniques of The General Mode Combination of Different Adjustment Models, Step By Step Adjustment Techniques, Selected Methods of Solving Large Systems of linear Algebraic Equation, Selected Techniques for Prediction, Approximation and Filtering.

CEP 512 Positions Determination Systems

Basic Idea of Positioning By Satellites, Satellite Orbital Space Geometry, Satellite Coordinates and Associated Transformations, Review of Different Satellite Positioning Systems (Photographing, Ranging, Doppler, GPS), Description of The Global Positioning GPS System, Types of GPS Observable, GPS Error Analysis, GPS Observing Techniques, GPS Alternative Solutions and Adjustment, GPS Application in Surveying and Geodesy.

CEP 513 Surveying for Engineering Projects

Surveying Techniques Suitable for Small Projects, Surveying Techniques Suitable for Medium Projects, Surveying Techniques Suitable for Big Projects, Surveying Techniques Suitable for Projects Related to Special Mechanical and Steel Constructions, Coordination Between Surveying Works and The Civil and Engineering Works of The Project, Continuity of Surveying Works Needed for The Project Before, During, and After The Establishment of The Project.

CEP 514 Principles of Remote Sensing

Fundamental Considerations, Electromagnetic Energy, Electromagnetic Spectrum, Image Characteristic, Vision, Sources of Remote Sensing Information, Aerial Photography, Interactions Between Light and Matter, Characteristics of Aerial Photographs, Black and White Photography, Infra-Red Color Photography, Spectral Reflectance, Multi Spectral Photography and Imagery, Sources of Aerial Photographs, Satellite Imagery, Landsat Imagery, Spot Imagery, Other Remote Sensing Systems, Thermal Infra-Red Imagery, RADAR Imagery, Digital Image Processing, Information Extraction, Strategy and Hardware for Image Processing, Applications in Civil Engineering.

CEP 515 Surveying Computations and Drawing

Basic Definitions, Uses of Coordinates in Surveying Computation: Justification, Coordinate Systems and Associated Term, Basic Calculation, Checking of Observations and Computations, Computation of Point Coordinates from Data Acquired By Different Methods: Offset, Polar, Intersection, Resection, Transformation of Coordinates Between Different Cartesian Coordinates Systems, Available Software, Drafting: Manual, Computer-Aided.

CEP 516 Physical Geodesy

Fundamentals of The Earth's Gravity Field (Gravity, Potential, Level Surfaces), Gravity Measurements and Reduction, (Absolute and Relative Measurements, Gravity, Gravity Anomalies), The Three Main Boundary Value Problems of Physical Geode and Their Solutions, Geode Determination Techniques (Astro-Geodetic, Gravimetric, Satellite), High Systems (Orthometric, Dynamic, Normal), Gravimetric Effect of Geodetic Measurements, Techniques of Gravity Prediction and Applications of Gravity Anomalies.

CEP 517 Analysis of Deformation Measurements in Constructions

Causes of The Structural and Terrain Deformation, Internal and External Factors Affecting The Deformation of Structures and Their Relation with The Stress Strain Theory, Methods for Measuring The Vertical Movements, Methods for Measuring The Horizontal Movements, Methods for Measuring The Movements in 3D, Analysis of The Field Measurements, Statistical Theories for Deformation Data Analysis, Concluding The Results and Writing The Reports.

CEP 518 Design and Processing of Surveying Measurements

Fundamentals of The Theory of Probability, Fundamentals of The Theory of Statistics, Univariate Probability Distribution Functions, Internal Estimation and Hypothesis Testing, Measures of Quality of Geodetic Networks (Precision, Reliability, Sensitivity, Outliners Detection), Optimization Methods, Techniques of Pre Analysis and Design of Surveying Measurements, Technique of Post Statistical Analysis of Survey Adjustment Results.

CEP 519 Applications of Astronomy in Surveying

Celestial Bodies, Celestial Spare and Celestial Coordinate Systems, Astronomic Triangle and Its Solutions, Special Star Positions, Concept of Time Systems (Sidereal, Solar, Atomic), Variations in The Celestial Catalogues and Epheinerids, Deferent Techniques for Astronomic Latitude Determination, Deferent Techniques for Astronomic Azimuth Determination, Applications of Astronomic Measurements in Surveying and Geodesy.

CEP 520 Land Information System (LIS)

Information Systems (Features, Administration, Decision), Geo Information Systems (GIS LIS) Processing (Classification, Transformation, Programming) Data Input and Data Output Format and Management (Traditional Filing Systems, Architectural of Data Base Systems, Standard and Non-Standard Approaches) Distributed Systems (Computer Networks, Data Communication Technology) Project Selection, Design and Implementation.

CEP 521 Principles of Hydro-Graphic Surveying

Scope of Hydro-Graphs, Kinds of Hydro-Graphic Projections, Physical Environmental Effects and Operations (Observation of Water Flow, Waves, Fides,...), Planning of Matinee Surveying Projects, Survey Techniques on Shore, Survey Techniques OFF Shore: Vertical Measurement of Depth By Sounding, Horizontal Control of The Sounding Positions, Reduction of Sounding to a Datum, Data Processing, Establishment of Marine Surveying Maps, Construction of Engineering Marine Projects (Pipelines, Charting Data Handling and Liability, Marine Environmental Operation Studies), Different Procedure for Vat Sampling and Bottom Sampling and Location Determination.

CEP 522 Dynamic Geodesy

Earth Dynamic, Earth Rotation, Earth Polar Motion, Earth Tides, Crystal Movements Measurements, Satellite Dynamic and Perturbation, Satellite Orbital Analysis, Inertial Survey System and Its Integration with Other Physical Tenestrial and Space Systems, Satellite Altimeter and Sea Surface Variation and Topography, Earth Orientation Parameters.

CEP 523 Map Projection and Coordinate Systems

Coordinate Reference Systems on Plane and Sphere (Geographical and Cartesian), Some Basic Ideas About The Mathematics of Map Projection, Classification and Naming of Map Projection (Plane, Conical, Cylindrical), Choosing a Suitable Map Projection, The Transverse Macerator Projection, Applications of Map Projection in Surveying.

CEP 524 Writing Surveying Reports

Conception of The Report Subject, Data Gathering, Classification and Storage, Classification of Reports, Qualities of Effective Reports, Report Format, Basic Writing Principles, Contents of Format Reports, Graphic and Tabular Presentation of Results, Documentation, Filing and Storage Security.

CEP 525 Management of Surveying Projects

Parameters of Surveying Engineering Projects, Power and Instrumental Resources Needed for The Projects, Study of The Surveying (Electrical, Mechanical, Environmental), Analysis for The Required Surveying Works Before, During, and After The Constriction. Design of The Project Time Table, Design of The Time Table of The Revision Supervision, Quality Control Software Packages, Applications.

CEP 526 Topographic Photogrammetric Surveying

Geometry of Air Photographs, Classical Methods of Photogrammetric Mapping, Derivation of Height Information from Parallax Measurements, Cameras, Processing, Plotting Instruments, Analog Aerial.

CEP 530 Highway Planning and Feasibility Studies

Reconnaissance Studies, Route Selection, Economic Analysis and Feasibility Studies-Preliminary Engineering Studies.

CEP 531 Highway Geometric Design

Highway Classification, Traffic Characteristics, Geometric Design Controls and Criteria Horizontal and Vertical Alignment, Planning and Design of Highway Intersections and Interchanges, Traffic Control Devices.

CEP 532 Highway Construction Materials

Soil Characteristics for Highway Construction, Base and Sub-Base Materials, Asphalt Concrete Materials, Asphalt and Cement Concrete Mixtures.

CEP 533 Hydrological Studies of Highways

Meteorological Information, Morphological Computations of Wadis and Basins, Determination of Water Discharge Flow, Hydraulic Design of Storm Water Drainage Structures, Highway Protection Techniques Against Storm Water.

CEP 534 Structural Design of Highway Pavements

Vehicle Characteristics and Traffic Loading, Stress Analysis in Flexible and Rigid Pavements, Structural Design of Pavements.

CEP 535 Principals of Highway Construction Documentation

Technical Specifications for Highway Construction, Conditions of Contract, Bills of Quantities and Basis of Payment, Construction Documents.

CEP 536 Airport Planning and Design

Airport Components, Aircraft Types and Characteristics, Airport Planning, Geometric and Structural Design of Airfield Strips and Aprons, Marling Signs Navigation Aids and Lighting.

CEP 537 Highway Construction Technology and Quality Control

Highway Embankment Construction Technology, Pavement Construction Technology, Management of Production of Asphalt Mixture, Quality Control and Quality Assurance.

CEP 538 Highway Maintenance

Pavement Distress and Condition Evaluation, Maintenance Operations for Pavements, Drainage Structures and Highway Furniture Elements, Pavement Recycling, Maintenance Management Systems.

CEP 539 Highway Construction Management

Highway Project Management Procedures and Methodology, Application of Highway Project Management, Application of Value Engineering in Highway Projects.

CEP 540 Railway Capacity

Definitions, Trains Running with Uniform Speed, Trains Running with Variable Acceleration, Brake System Dynamics, Signals Systems, Factor Affecting Railway Capacity, Railway Capacity Improvement Priorities, Line Capacity, Car Capacity and Station Capacity.

CEP 541 Railway Alignment

Railway Alignment Rules, Factors Affecting Alignment, Surveying, Vertical and Horizontal Curves Design and Adjustments, Construction Limits (Gaparite), Schedule Time Table Design to Execute Railway Constriction Project.

CEP 542 Metro, Lines Alignment and Operating

Metro Lines Types, Characteristics As Geometric and Structural Point of View, Metro Stocks Characteristics, Metro Gates to Or From Station, Special Requirements for Underground Metro, Signals and Automatic, Centralized Traffic Control Systems, Metro Line Capacity and Factors Affecting It, Operating Cost and Pricing Policy Study.

CEP 543 Railway Track Elements Design

Mechanical Characteristics of Track Subgrade and Stabilization Methods, Railway Defects: Measurement and Maintenance, Railway Track Static and Dynamic Studies, Wheel–Rail Contact, Swaying and Derailment, Railway Vibration, Sleeper and Ballast Design, Rail Design, Welding Rail, Fatigue, Passenger Comfort, Rail Sleeper Fastening, Fishplates and Anticreeper, Railway Gaparite and Right of Way, Concrete Sleeper Production and Consumption.

CEP 544 Rapid Speed Train Technology

Rapid Speed Train Characteristics, Technical Demandes and Requirements for Geometric Alignment and Structural Design of Lines, Turnouts, Station, Signals and Traffic Control System for Rapid Speed Trains Lines, Maintenance and Renewal of Rapid Train Lines. Economical & Feasibility Study for Rapid Speed Trains Lines Operations.

CEP 545 Railway Turnouts Design

Turnouts: Types and Function, Switches Types in The Railway, Switch Design, Diamond Crossing, Cross–Over, Scissor Crossover, Slip–Double –Junction, Rapid Speed Turnouts, Level Crossing Between Railway and Roads, Level Crossing: Specifications and Types, Special Conditions for Turnouts Execution, Turnouts Safety and Operating, Turnouts Maintenance and Renewal, Turnouts Development Technology.

CEP 546 Railway Station Planning

Stations Types, Passenger Stations Design, Station Components: (Station Parking, Building, Platform, Tracks, Turnouts, Subway and Footbridge, and Signal Cabin), Freight Stations, Marshaling Yards, Car Turnaround, Container Stations, Passenger and Freight Stations.

CEP 547 Railway Signals

Signal Systems: Mechanical, Electrical, Partial Interlocked & Non Interlocked Signals, Main & Secondary Signals Turnouts & Signal Safety Methods, Signal Cabins, Centralized Traffic Control Design, Mechanical Interlocking, Light Signals, Automatic Block Section, Train

Driver Cabin Indicators, Centralized Traffic Control (C.T.C) & Automatic Train Control (A.T.C), Signal System Effects on Operating, Line, Car and Station Capacity.

CEP 548 Railway Maintenance and Renewal

Rolling Stock Maintenance, Railway Track Elements Examine and Measurements, Track Maintenance and Renewal Methods, Tolerance and Specifications, Rail Defects Measurements Devices, Maintenance Types, Renewal and Construction Equipments, Speed Limits for Track Under Maintenance, Maintenance and Renewal Turnouts and Signals, Periodic and Seasonal Schedule for Maintenance, Economic Effect Study for Railway Maintencence and Renewal.

CEP 549 Advanced Technology of Railway Signals

Automatic and Light Signals Development Study for Both Urban (Underground Metro) Or Rural Trains, Train Driver Cabin Signals, Centralized Traffic Control (C.T.C) and Automatic Train Control (A.T.C) Study, Remote Sensing System for Train Operating, Line, Car, Station Capacity Improvements By Using Developed Signal System.

CEP 550 Introduction to Urban Transportation Planning

Transportation Planning Stages, Data Collection for Urban Studies, Analysis and Collaboration of Data, Study Sectors and Zoning System, Trip Generation and Distribution, Mode Choice, Road Network Planning and Evaluation, Public Transport on Road Network.

CEP 551 Urban Transportation Planning

Transportation Planning Stages, Transportation Problems Definition, Data Collection, Trip Generation, Trip Distribution, Modal Choice, Network Planning and Trip Assignment, Transportation Projects Evaluation.

CEP 552 Public Transportation Planning

Overview of Transportation Planning, Introduction to Transit Planning, Transit Networks, Time Transfer Network, Transit Route Planning, Transit Schedule Planning, Transit Revenue.

CEP 553 Statistical Applications in Transportation

Introduction to Sampling Techniques, Probability and Probability Distributions, Discrete and Continuous Models, Applications of Statistical Procedures, Estimation with Small Samples, Fitting Procedure, Statistical Analysis of Before and After Studies.

CEP 554 Freight Transportation System

Framework of Transportation Planning, Data Sources and Collection, Aggregate Demand Models, Application to Commodity Flow.

CEP 555 Transportation Systems Analysis

Principles of System Analysis, Traditional Transportation Demand Model, Critique of The Four Step Model, Travel Budget and Levels of Choice, Behavior Modeling, Land Use Models.

CEP 556 Computer Applications in Transportation

Techniques of Analytic and Simulation Modeling, Steps in Developing a Simulation Model, Simulation Methodology Including Generation of Random Numbers and Variables, Validation and Analysis of Simulation Modeling and Results, Computer Simulation Models, Signalized Intersections, Arterial Network and Freeway Corridors.

CEP 557 Transportation Economics

Annual Cost Formulas, Motor Vehicles Operation Cost and Economic Analysis, Economic Theory and Behavior of Large Transportation Systems, Urban and Intercity Passengers and Freight, Estimation and Application of Production Costs, Demand Functions, Evaluation of Governmental Transportation Policies, Economic Regulations, Infrastructure Investments, Pricing and Financing Costs, Benefit Analysis Impact Upon Economic Efficiency.

CEP 558 Expert Systems for Transportation

What is an Expert System, Expert Systems Versus, Conventional Software, Problem Solving Using Expert System Techniques, Attributes and Characteristics of Expert Systems, Knowledge Representation, Matching and Search as Problem Solving Methods, Uncertain and Inaccurate Knowledge, Tools for Building Expert Systems, Applicability of Pavement Maintenance and Rehabilitation Expert System, Site-Impact Analysis Expert System, Traffic Signal Expert System, Class Project.

CEP 559 Transportation Network Equilibrium

Network Representation, Network User Equilibrium, Basic Concepts in Minimization Problems, Formulating The Assignment Problem as a Mathematical Problem, Review of Some Optimization Algorithms, Solving of User Equilibrium, User Equilibrium with Variable Demand, Combination of Trip Distribution, Traffic Assignment, Modal Split Models.

CEP 560 Sanitary Chemistry

Water Quality and Methods of Measurements, Design of Water Quality Measurement Program, Physiological and Physical Properties Such as pH, Hardness, Nitrogen, Phosphorus, Phosphate, Sulfate, Chlorides, Dissolved Oxygen, Chlorine, Iron and Manganese, Water Pollution with Pesticides, Methods of Removal of Dissolved Organic Matter, Methods of Determination of BOD, COD, and TOC.

CEP 561 Bacteriology of Water and Wastewater

Major Groups of Micro Organisms, Advantages of Algae and Its Role in Sewage Treatment, Bacterial Physiology and Metabolism Including Growth Requirements, Action of Micro Organisms Especially Bacteria on Different Substrates, Pollution of Water By Different Microbes, Value and Significance of The Bacteriological Examination, Factors That Influence Bacteria in Water, Indication of Water Pollution By Bacteria, Different Microbial Indicators of Water Pollution and Its Detection, Water Borne Diseases.

CEP 562 Environmental Engineering and Pollution Control (1)

Main Parameters of Environment Impacts on The Projects, Environmental Impacts of The Project on The Human, Environmental Impacts of The Project on The Animals, Environmental Impacts of The Project on The Plants, Environment Impacts of The Project on

The Birds, Environmental Impacts of The Project on The Rest of Components of The Environment, Environmental Impacts of The Project During The Construction, Environmental Impacts of The Project After Construction, Governing Laws.

CEP 563 Water Treatment

Coagulation and Flocculation, Sedimentation, Filtration, Disinfecting and Its Different Application, Adsorption, Iron and Management Removal, Water Desalination, Softening Organic Matter Removal, Heavy Metals Removal, Sludge Treatment, Fluoridation Water Quality Regulations.

CEP 564 Wastewater Treatment

Quantity and Quality of Wastewater, Primary Treatment, Suspended Growth Biological Treatment, Attached Growth and Dual Biological Treatment, Nitrification, Identification, Phosphorus Removal, Chemical Treatment, Anaerobic Treatment, Oxidation Ponds, Aerated Lagoons, Land Application, Disinfecting, Upgrading of Existing Wastewater Treatment Plants.

CEP 565 Sludge Treatment

Characteristics and Volume of Sludge, Sludge Handling, Sludge Stabilization, Thermal Processing of Sludge, Ultimate Disposal and Utilization of Sludge, Sludge Denaturing.

CEP 566 Introduction to Computer Applications in Traffic & Transportation

Identification of Some Transportation and Traffic Software, Use of Some Statistical Software in Transportation, Using of Some Software in Analyzing Traffic and Speed Data.

CEP 567 Projects Management and Operation

Process Optimization, Performance Evaluation of The Projects, Economics of Water Projects, Project Follow Up, Process Auditing, Real Time Control, Project Maintenance.

CEP 568 Industrial Water Supply

Treatment of Boiler Water, Cooling Water Circuits, Problems Associated with Industrial Water Supply, Industrial Water Supply for Metallurgical Industry, Paper Industry, Food Industry, Agricultural Industry, Textile Industry, Chemical and Pharmaceutical Industry and Other Industries, Reuse and Recycling of Industrial Water.

CEP 569 Industrial Wastewater Treatment

Effect of Industrial Wastes on Sewerage System and Wastewater Treatment Plant, Methods of Industrial Wastes Produced from Paper Industry, Textile, Feed Industry, Pharmaceutical Industry, Steel Industry, Reuse of Treated Industrial.

CEP 570 Solid Wastes

Source, Composition, Properties and Quantities of Solid Wastes Handling and Storage at The Source, Methods of Solid Wastes Collection, Methods of Solid Wastes Collection and Methods of Disposal, Separation and Processing Technologies, Recycling of Solid Wastes, Planning and Operation of Solid Wastes Management System.

CEP 571 Traffic Impact Studies

Determination of The Affected Area Around The Activities, Traffic Data Collection for The Adjacent Transportation Network, Assessment of The Current Situation, Determination of The Trip Generation, Trip Distribution, Modal Split, and Trip Assignment for The Activity, Assessment of The Future Situation, Proposals for Solving The Traffic Problems Resulted From The New Activity.

CEP 572 Wastewater Collection Systems

Sources and Wastewater Flow, Types of Collection System, Planning of Collection System, Hydraulic Design of Gravity Sewers, Sewers Materials, Appurtenance of Sewers, Biological Decomposition in Sewers, Pumping Stations, Design of Force Mains, Water Hammer in Force Mains, Test of Sewers.

CEP 573 Water Collection Works

Types of Intake, Choice of Proper Location, Hydraulic Design of Pipe Intakes, Design of Low Lift Pump and Water Transmissions Lines, Types and Design of Water Screens, Ground Water, Types of Wells, Hydraulic Design of Wells, Types of Pumps Used to Lift Ground Water.

CEP 574 Environmental Engineering and Pollution Control (2)

Polluted Water and Its Environmental Impact, Reuse of Domestic Wastewater and Its Environmental Impact, Reuse of Industrial Wastewater and Its Environmental Impact, Pollution of Ground Water and Surface Water, Engineering Works to Protect Natural Water Against Pollution.

CEP 575 Master Planning for Sanitary Projects

Basic Studies, Population, Rate of Water Consumption, Rate of Sanitary Wastewater Disposal, Climatic Condition, Topographical and Surveying Studies, Geotechnical Studies, Feasibility and Economic Studies, Optimization and Deign, Environment Consideration.

CEP 576 Water Pollution

Characteristics of Water, Pollutants of Water and Its Sources, Dangerous of Water Pollution, Methods of Measuring Water Pollution, Controlling of Water Pollution, Treatment of Polluted Water.

CEP 577 Soil Pollution

Soil Properties, Pollutants of Soil and Its Sources, Dangerous of Soil Pollution, Methods of Measuring Soil Pollution, Controlling of Soil Pollution, Treatment of Polluted Soil.

CEP 578 Noise & Vibrations

Hearing Pollution Definitions & Dangerous, Noise & Vibrations Causes, Sourses of Noise & Vibrations, Methods of Measuring of Noise & Vibrations, Controlling of Noise & Vibrations, Treatment of Noise & Vibrations Problems.

CEP 579 Air Pollution

Composition of Air, Pollutants of Air and Its Sources, Dangerous of Air Pollution, Methods of Measuring Air Pollution, Controlling of Air Pollution, Treatment of Polluted Air.

CEP 580 Railway Environmental Effects

Importance of Environmental Studies, Air Pollution, Main Air Pollutants, Mathematical Air Pollution Models, Noise: Railway Noise Problems, Specifications and Mathematical Models, Vibrations Effects on Both Track and Adjacent Buildings, Mathematical Models for Vibrations Value and Their Effects.

CEP 581 Traffic Flow Theories

Traffic for Elements, Traffic Measurements and Distributions, Traffic Stream Models, Supply, Demand Modeling, Fundamental Traffic Stream Modeling, Car Following Models, Shock Wave Analysis and Hydrodynamic Models, Queuing Analysis, Simulation of Traffic Behavior.

CEP 582 Traffic Studies and Analysis

Traffic Data, Nature and Needs, Data Types and Relevant Statistical Theory, Traffic Analysis Process, Presentation of Data and Descriptive Statistics, Experimental Design and Sample Theory, Vehicle Progression, Hypothesis Testing and Non-Parametric Testing, Distribution Fitting, Vehicle Counting and Classification, Speed, Travel Time and Delay Surveys, Origin Destination Surveys, Vehicle Impact, Traffic Generation Surveys, Parking Surveys and Safety Surveys, Environmental and Energy Impacts, Modern Technology in Traffic Data Collection, Technology of Vehicle Detection, Traffic Data Logging Video Based Traffic Data Collection, Data Analysis and Interpretation, Model Development, Optimization and Information Theory.

CEP 583 Traffic Management and Control

Objectives of Traffic Management, Procedures for Implementing TSM, Environmental Protection and Enhancement, Measures Influencing Vehicle Speed, Facilities for Pedestrians, Facilities for Buses, Management of Heavy Goods Vehicles, Economic Returns of Traffic Management.

CEP 584 Traffic and Roads Impact on Environment

Introduction on Socio-Economic Impact of Transportation Projects, Requirements of Environmental Studies, Environmental Impact Statements, Air Pollution Sources and Composition, Mathematical Models, Noise and Attenuation Measures, Visual Intrusion and Impact.

CEP 585 Traffic Systems Analysis

Introduction to Systems Analysis, Liner and Non-Linear Models, Traffic Characteristics and Composition, Traffic Measures of Performance, Interaction Among Transport Systems, Evaluation of Traffic Operations, Systems Economics and Finance, Environmental Considerations.

CEP 586 Traffic Flow Theories and Engineering

Deterministic Models, Capacity, Differential and Integral Equations, Shock Wave Theory, Traffic Flow Parameters Measurements, Stochastic Models, Queuing Theory, Vehicles and Pedestrian Delays, Maximum Probability Theory for Gap Acceptance Estimation, Engineering Applications, Optimum Usage of Traffic Signals, Buses Unloading, Determination of Critical Zones, Cycle Time Calculation and Green Allocation, Actuated Traffic Signals Systems.

CEP 587 Statistical Applications to Traffic Operations

Introduction to Statistical Distributions, Sampling Procedures and Sample Size, Fitting Procedures, Speed Distribution, Volume Distribution, Time Headway Distribution, Statistical Significance of Traffic Improvement Measures.

CEP 588 Traffic Accidents and Roads Safety

Accidents Incidents and Conflicts, Types of Accidents, Identification of High Accidents Locations, Human Factors and Behavior, Vehicular and Pedestrian Safety Requirements, Data Collection Procedure, Computerized Recording of Data Collection, Accidents Statistics, Accidents Rates and Their Usage, Statistical Analysis of Before and After Accidents Data, Accidents Prediction Models, Site Analysis Environmental, Geometric and Physical Conditions of The Site, Evaluation of Safety at Site, Approaches to Highway Safety, New Techniques in Safety Analysis, Traffic Conflict Techniques.

CEP 589 Advanced Traffic Control Devices

Simulation of Traffic at Junction and on Corridors, Calibration of Traffic Movement, Advanced Traffic Control Systems at Junctions, Optimization and Coordination of Signals, Freeway Traffic Control, Central Traffic Control Systems, Intelligent Transport Systems.

CEP 590 Reuse & Recycling

Types of Wastes, Sources of Wastes, Wastes Treatment Processes, Recycling, Solid Wastes Reuse, Wastewater Reuse, Gas wastes Reuse, Conditions of Reuse.

CEP 591 Engineering Economics

Equivalence, Interest Factors and Problems, Annual Cost Method, Present Worth Method, Rate of Return Method, Benefit to Cost Ratio Method, Income Tax, Depreciation, Choice of Growth Factors, Multiple Alternatives, Sensitivity Tests, Expected Cost, Increment Cost, Sunk Cost, Source of Funds, Cost Effectiveness Method.

CEP 592 Environmental and Social Studies

Main Factors Officiating The Environment, Environment Problems, Socio-Economic, Physical Characteristics for Study Area, Methods for Population Prediction in The Future, Environment Impacts of Infrastructure Projects, Environmental Law and Their Suitability for The Protection of The Environment.

CEP 593 Properties & Evaluation of Environmental Quality

Sampling and Analysis Techniques, Data Requirements for Pollution Control, Archiving Data, Importance of Flow Measurement, Sampling Techniques, Data Handling and Presentation, Assessment Quality Models, Describing Uncertainty, Hypothesis Testing, Simple Linear Regression Models, Problems of Projects Auditing in Egypt and Their Solutions, Examples of Auditing Projects.

CEP 594 Plants Performance Evaluation

Sampling and Analysis Techniques, Data Requirements for Plant Control, Archiving Data, Importance of Flow Measurement, Sampling Techniques, Data Handling and Presentation, Assessment Quality Models, Describing Uncertainty, Hypothesis Testing, Evaluation & Follow up Programs, Examples of Evaluating Plants Performance.

CEP 595 Public Health

Responsibilities of Public Health Engineer, Vital Statistics Communicable Discuses, Methods of Infection and Prevalence and Etiologic Agents, Control of Commercial Diseases, Public Health Haggard of Solid Waste System, Public Health and Water Supply, Public Health and Sanitary Waste Water, Public Health and Air Pollution, Occupational Health, Supervision of Recreational Activities, Public Health Education.

CEP 596 Transportation Policy and Planning

Role of Transportation in The Country Planning Policy, Basics and Role of Different Modes of Transport, Interaction Between Land Uses and Persons and Freight Transport, Transportation Planning Process, Fundamentals of Transportation Economics, Planning and Operation of Public Transport. Different Policies in Freight and Pass Transport for The Urban and Regional Level.

CEP 597 Transportation and Traffic Planning (1)

Systems of Transportation Planning, Relation to Planning Urban Design, Study of a Site and The Possibilities of Reaching It Through Different Traffic Networks (Hand Transportation, Trains, Water Air Transportation), Relation of Local Traffic Networks (In The Framework of Urban Projects) with Regional Networks, Systems of Calculation of Traffic Flow in to Developing Areas.

CEP 598 Transportation and Traffic Planning (2)

Ways and Systems of Transportation in World Cities, Comparing with The Resent Condition in Egypt, Different Transportation Systems in Egypt and Assessing Their Performance and Understanding The Administrative and Economic Factors, The Environmental Effect of The Transportation Present, Systems of Upgrading and Its Competence, Transportation from a Planning Perspective and The Neutral Relationship Between Planning on The Local Regional and National Level and Between Systems of Transportation on The Previous Levels, The Basis of The Design of a Transportation Network, Factors Affecting The Norms and Different Levels of Planning.

CEP 599 Traffic Engineering

Introduction: What is Traffic Engineering?, Traffic Problems, Characteristics of Driver, Pedestrian, Vehicle, and 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, Studies of High-Parking, Safety Studies.

CEP 602 Photo Interpretation and Digital Image Processing

Principals of Photo Interpretation, Image Quality, Factors Affecting Image Quality and Interpretation, Pattern Recognition and Analysis, Geologic and Geomorphologic Applications, Types of Digital Imageries, Radio Metric Properties of Digital Images, Processing Techniques of Digital Images, Enhancement, Filtering, Classification, Applications.

CEP 603 Photogrammetry

Aerial Surveying, Types of Aerial Photo, Geometry of Overlapping Aerial Photos, Determination of 3D Coordinates from Planning of Aerial Surveying Projects, Modern Techniques in Photo Grammetry, Types of Terrestrial Cameras, Calibration of Cameras, Determination of Three Dimensional Coordinates from Terrestrial Photos, Applications.

CEP 604 Digital Maps and Map Production

Techniques for 2D and 3D Digital Maps, Digital Topographic Database, DTDB, Superposition of Digital Map and Raster Image Application in GIS and Navigation, Software Used in Map Production, Updating of Raster Images, Vectorization of Raster Images, Merging of DTM and Digital Maps, Printing.

CEP 605 Hydro-Graphic Surveying

Scope of Hydro-Graphs, Types of Hydro-Graphic Projections, Physical Parameters effects, Hydro-Graphic Survey, Planning for Marine Surveying Projects, On-Shore Surveying Techniques, Off-Shore Surveying Techniques, Data Processing, Marine Maps Applications.

CEP 606 Surveying Data Collections and Computations

Types of Surveying Data, Techniques of Surveying Data Collection, Integration and Computability of Surveying Data, Data Preparation for Computer Processing, Use of Coordinates in Surveying Computations, Types of Surveying Coordinate Systems, Determination of Point Coordinates from Different Surveying Measurements, Transformation of Coordinates, Available Software for Computations and Drafting.

CEP 607 Physical and Dynamic Geodesy

Fundamentals of The Earth Gravity Field, Gravity Measurements and Reductions, Geodesy Determination Techniques, High Systems, Gravimetric Effect on Geodetic Measurements, Celestial Bodies, Spheres and Coordinate Systems, Concept of Time Systems, Determination of Astronomical Coordinates and Azimuth, Earth Rotation and Tides, Crystal Movement Measurements, Satellite Dynamics, Inertial Surveying System and Its Integration with Other Systems.

CEP 608 Geometric Geodesy and Position Determination Systems

Geodetic Datum, Ellipsoid Geometry, Reduction of Terrain Measurements, Geodetic Coordinate Systems and Transformation, Position Determination in 2D and 3D Systems, Satellite Geodesy, Stiletto Coordinates and Transformation, Types of GPS Observations, GPS Error Analysis, GPS Measuring Techniques, Application.

CEP 609 Construction Deformation Measurements

Surveying for Buildings, Route Surveying, Tunnel Surveying, Surveying for Infra-Structure Projects, Surveying for Machines Installations and Fittings, Sources and Types of Structure Deformation, Surveying Techniques for Detecting Vertical Movements, Surveying Techniques for Detecting Horizontal Movement, Techniques for Detecting 3D Movements, Analysis of Collected Data, Presentation of Results.

CEP 610 Adjustment and Analysis of Surveying Measurements

Univariate and Multivariate Statistics and Error Propagation, General Model for Combined Least Squares Adjustment, Parametric and Conditional Adjustment as Special Techniques, Combination of Different Adjustment Models, Step By Step Adjustment Techniques, Probability Distribution Functions, Interval Estimation and Hypothesis Testing, Measures of Quality of Surveying Networks, Optimization Method Techniques of Pre-Analysis and Design of Surveying Measurements, Techniques of Post-Statistical Analysis of Adjustment Results.

CEP 611 Cartography and Map Production

Types of Maps, Conventional Maps, Digital Maps, Layout of The Map Sheet, Symbolization, Map Compilation from Different Sources, Maps as Legal Documents, Coloring of Maps, Masking, Scribing, Printing, Archiving, Reduction of Maps, Map Projection Systems and Transformation.

CEP 612 Land Information Systems and Digital Terrain Models

Information Systems, Geographic Information System (GIS, LIS) Processing, Transformation, Classification, Programming, Data Input and Output Formats and Alternatives, Database Management, Database Systems Standards, Non-Standard Approach, Distribution System, Project Selection, Design, and Implementation. Mathematical Methods for The Digital Terrain Models, Digital Terrain Models Derived from Tops Maps, Integration of DTM with Surveying Data, Applications.

CEP 613 Remote Sensing

Fundamentals, Electromagnetic Energy and Spectrum, Image Characteristics, Vision, Source of Remote Sensing Information, Interaction Between Energy and Matter, Characteristics of Aerial Films, Spectral Reflectance, Multi-Spectral Photography and Imagery, Remote Sensing Systems, (Multi-Spectral Scanners, Thermal Infrared Scanners, Microwave Imaging Systems, Solid Array Systems, Operational R. S. Systems, Application.

CEP 614 Management and Reporting of Surveying Projects

Main Elements of Surveying Projects, Estimation of Surveying Project Requirements Surveying Reference Data (Man, Power, Equipment), Planning and Design of Surveying Control Network, Planning and Construction for Surveying Moments, Time Schedule for The Elements of Surveying Projects (Planning, Field Works, Office Works), Field Check, Revision and Quality Control, Concept of Report Writing, Report Format, Basic Writing Principals, Contents of Formal Reports, Graphic and Tabular Presentation of Results, Filing and Security Procedure for Report.

CEP 615 Infra Structure Utilities and Surveying

Design of Control Networks, Highway Surveying, Surveying for Sanitary Engineering Projects, Setting Out of Infrastructure Projects, Role of Global Positioning System (GPS) in The Execution of The Infrastructure Projects, Coordination of Public Works Engineers for Performing Surveying Works Before, During and After The Execution of The Infrastructure Projects.

CEP 616 Application of GIS in Utilities Projects

Advanced Survey By GPS, Field Observations, Static and Kinematics Relative Positioning, Real Time Kinematics Positioning for Wide Areas, Application of GPS in Highway, Railway and Traffic Works, Integration of Total Station and GPS, Execution of Extended (Longitudinal) Projects.

CEP 617 Legal Registration and Cadastral Surveying

Types of Cadastral Maps (Hard Copy and Digital), Map Elements, Design of Library for Abbreviations and Symbols, Map Production of Different Scales From Cadastral Maps, Relationship Between Cadastral Maps, Legal Registration and Land Division Inside Towns and Agricultural Lands with The Relationship Between Water Recourses and Highways Legal and Cadastral Registration and Cadastral Taxes, Database for Cadastral Surveying.

CEP 618 Digital Maps From Mobile Sensors

Introduction to Digital Maps-Types of Sensors-Inertial Navigation Sensors- Types of Inertial Navigation Sensors, Point Positioning By Inertial Navigation Sensors, Errors in Inertial Navigator Sensors, Applications of Point Positioning By Kinematics GPS, Simultaneous Equations for Different Coordinate Systems for Sensors.

CEP 619 Quantity Survey and Its Applicants in Civil Engineering

Introduction to The Different Methods of Areas Computation and Volume Computation for Earth Works, Equations for Area and Volume Computations –Applications of Volume Computation in Highways, Volume Computation By Accumulative Method, Swell and Shrinkage Coefficients.

CEP 630 Advanced Highway Planning and Feasibility Studies

Advanced Studies on The Following Topics: Reconnaissance Studies, Route Selection, Economic Analysis and Feasibility Studies, Preliminary Engineering Studies, Principles of Planning.

CEP 631 Advanced Highway Geometric Design

Advanced Studies on The Following Topics: Highway Classification, Traffic Characteristics, Geometric Design Controls and Criteria Horizontal and Vertical Alignment, Planning and Design of Highway Intersections and Interchanges.

CEP 632 Advanced Soil and Materials Studies for Road Construction

Advanced Studies on The Following Topics: Soil Characteristics for Highway Construction, Base and Sub-Base Materials, Asphalt and Concrete Materials, Asphalt and Cement Concrete Mixtures.

CEP 633 Advanced Hydrological Studies of Highways

Advanced Studies on The Following Topics: Meteorological Information, Morphological Computations of Wadies and Basins, Determination of Water Discharge Flow, Hydraulic Design of Storm Water Drainage Structures, Highway Protection Techniques Against Storm Water.

CEP 634 Advanced Structural Design of Highway Pavements

Advanced Studies on The Following Topics: Vehicles Characteristics and Traffic Loading, Stress Analysis in Flexible and Rigid Pavements, Structural Design of Pavements.

CEP 635 Highway Management Systems

Pavement Management Processes, Pavement Evaluation and Performance, Design Alternatives Analysis, Implementation of Pavement Management Systems, Examples and Applications.

CEP 636 Advanced Airport Planning and Design

Advanced Studies on The Following Topics: Airport Components, Aircraft Types and Characteristics, Airport Planning, Geometric and Structural Design of Airfield Strip and Aprons, Marling Signs Navigation Aids and Lighting

CEP 637 Advanced Highway Construction Technology

Advanced Studies on The Following Topics: Highway Embankment Construction Technology, Pavement Construction Technology, Management of Production of Asphalt Mixture, Quality Control and Quality Assurance.

CEP 638 Advanced Highway Maintenance

Advanced Studies on The Following Topics: Pavement Distresses and Condition Evaluation, Maintenance Operations for Pavements, Drainage Structures and Highway Furniture Elements, Pavement Recycling, Maintenance Management Systems.

CEP 639 Advanced Highway Construction Management

Advanced Studies on The Following Topics: Highway Project Management Procedures and Methodology, Application of Highway Project Management, Application of Value Engineering in Highway Projects.

CEP 640 Rapid Speed Train Technology

Rapid Speed Train Characteristics, Technical Demandes and Requirements for Geometric Alignment and Structural Design of Lines, Turnouts, Station, Signals and Traffic Control System for Rapid Speed Trains Lines, Maintenance and Renewal of Rapid Train Lines. Economical & Feasibility Study for Rapid Speed Trains Lines Operations.

CEP 641 Advanced Railway Alignment

Digital Contour Maps Preparation By The Use of The Modern Surveying Apparatus and Photogrametry Technology, Technical Demands for Alignment, Alignment By The Use of Computer, Cut / Fill Volumes Calculations, Schedule Execution Table Design, Set Up Vertical and Horizontal Curves, Railway Project Cost Analysis.

CEP 642 Railway Track Design and Analysis

Strain-Stress Analysis in The Parts of Railway Tack (Rails-Sleepers, Ballast, Subgrade) By The Use of Structural Analysis Theories, Dynamic Effect of Train Movement on Track Elements- Railway Defects and Their Effects on The Track Safety, How to Inspect and Repair Track Defects, Track Vibrations and Their Effects on Passenger Comfort and Freight Safety.

CEP 643 Modern Turnouts Technology

Turnouts Development, Methods and Modern Apparatus to Ensure Safety Operating of Both Switches and Trunouts, Level Corssing of Railway Track and Roads Specifications and Design, Movable Railway Bridge: Operating and Maintemonce.

CEP 644 Advanced Technology of Railway Signals

Automatic and Light Signals Development Study for Both Urban (Underground Metro) Or Rural Trains, Train Driver Cabin Signals, Centralized Traffic Control (C.T.C) and Automatic Train Control (A.T.C) Study, Remote Sensing System for Train Operating, Line, Car, Station Capacity Improvements By Using Developed Signal System.

CEP 645 Modern Methods of Railway Station Planning

Architectural, Aesthetic, Operational Requirements for Station Design, Railway Station Layout and Elements, Freight Station and Cranes Types, Locomotive, Stabling and Marshalling Yards Atomization, How to Improve Urban (Underground Metro) and Rural Station Capacity.

CEP 646 Modern Methods of Construction, Maintenance and Renewal of Railway Lines

Modern Machines and Apparatus for Inspection and Measurements Track Defects, Study of Methods and Machines to Construct and Renew Railway Lines, Modern Methods for Maintenance of Both Running Stock and Track, Modern Technology of Lines Operating Under Maintenance Or Renewal Without Delay, Economical Effect of Maintenance and Renewal on The Track Safety and Its Life Time Improvements.

CEP 647 Railway Environmental Effects

Energy Consumption in The Railway, Air Pollution, Forecasting Models for Air Pollution, Methods to Decrease and Limit Air Pollution, Noise Sources in Railway, Factors Affecting Railway Noise, Forecasting Models for Railway Noise Level, American and Germany Methods for Study Noise, How to Limit Railway Noise, Noise Prevention Barriers.

CEP 648 Railway Simulation and Modeling

Purpose, Simulation Systems and Models for Technical and Economical Considerations, Statistical Evaluation, Simulation Applications on Railway Lines & Train Movements, Railway Dynamics Models, Rail, Sleeper and Ballast Stress Distribution Models Programs, Curves Alignment Program.

CEP 649 Railway Freight Transport Systems

Freight Transport Systems Role Transport Chain, Freight Trains Types, Freight Transports Planning Problems, Marshalling Yards Container Transports, Station and Handle Systems. Handle Types and Tools, Store Methods, Freight Transport Methods.

CEP 651 Urban Transportation Planning

Introduction to Transportation Demand and Supply, Balancing Demand and Supply, Calibration of Trip Generation Models, Calibration of Different Gravity Models, Direct Demand Models, Mode Choice Models, Optimization of Transport Networks, Intercity Transportation Demand, Freight Transport.

CEP 652 Advanced Transportation Systems

Transport System Components, Forecasting Transport Demand, Interaction of Transport Systems and Land Use, Formation of Transport Networks, Direct Transportation from Origin to Destination, Mediators, Optimization of Urban and Regional Transportation Networks.

CEP 653 Transportation Networks Equilibrium

Network Simulation, Network User Equilibrium, Basic Concepts in Minimization Problems, Formulating The Assignment Problem as a Mathematical Problem, Review of Optimization Algorithms, User Equilibrium with Variable Demand, Aggregate Transportation Planning Process.

CEP 654 Transportation Economics

Annual Cost Equations, Motor Vehicle Operating Cost and Economic Analysis, Economic Theory and Behavior of Large Transportation Systems, Estimation and Application Costs for Urban and Inter-City Passenger and Freight Travel, Demand Functions, Evaluation of Governmental Policies, Economic Regulations, Infrastructure Investments, Pricing and Financing, Benefit-Cost Analysis, Impact on Economic Efficiency.

CEP 660 Hydraulics of Networks & Plants

Hydraulics Laws for pipes Design, Pressure Losses & Its Reasons, Effect of Pipe Material, Hydraulic Losses in Plants, Orifices & Weirs Effects, Flow Measurements in Plants, Pump Stations in Networks & Plants.

CEP 661 Chemistry of Water

Water Quality and Methods of Measurements, Ph, Alkalinity, Hardness, Nitrogen, Phosphates Sulfates, DO, Chlorine, Chlorides, Iron and Manganese, Heavy Metal, Insecticides, BOD, COD, TOC.

CEP 662 Microbiology of Water

The Major Groups of Microorganisms, Value and Significance of Micro-Biological Examinations, Pollution of Water By Different Microorganisms, Microbial Indicators of Water Pollution and Its Detection.

CEP 663 Advanced Water Treatment

Theory of Coagulation and Flocculation, Theory of Filtration, Types of Filters, Iron and Manganese Removal, Adsorption, Water Softening, Removal of Traces, Organic Matters and Heavy Metals.

CEP 664 Advanced Domestic Wastewater Treatment

Methods of Ammonia Removal, Nitrate Removal, Phosphorus Removal, Chemical Treatment, Filtration Treatment By Using Activated Carbon, Anaerobic Treatment.

CEP 665 Industrial Wastewater Treatment

Effect of Industrial Wastes on Sewerage System and Wastewater Treatment Plant, Treatment of Industrial Wastes Produced from Paper Industry, Textile, Food Industry, Pharmaceutical Industry, and Steel Industry. Reuse of Treated Industrial Wastes.

CEP 666 Advanced Studies for Solid Wastes

Advanced Studies on The Following Topics: Source, Composition, Properties and Quantities of Solid Wastes, Handling and Storage at The Source, Methods of Solid Wastes Collection, Methods of Solid Wastes Collection and Methods of Disposal, Separation and Processing Technologies, Recycling of Solid Wastes Planning and Operation of Solid Wastes Management Systems.

CEP 667 Impact of Pollution on Environment

Advanced Studies on The Following Topics: Water Quality and The Environment Impact for Its Pollution, Environment Impact of Wastewater and Industrial Wastewater, Pollution of Ground Environment Impact of Wastewater and Industrial Wastewater, Pollution Water Against Water, Pollution of Surface Water, Engineering Works to Protect Natural Water Against Pollution.

CEP 668 Advanced Sludge Treatment

Advanced Studies on The Following Topics: Characteristics and Volume of Sludge, Sludge Handling, Sludge Stabilization, Thermal Processing of Sludge, Ultimate Disposal and Utilization of Sludge, Sludge Denaturing.

CEP 669 Water Treatment Modeling

Water Modeling for Physical Properties & Chemical Actions with Hydraulic Equations, Applied Models for Coagulation and Flocculation, Filtration, Iron and Manganese Removal Methods, Adsorption, Disinfection, Water Softening, Removal of Traces, Organic Matters and Heavy Metals.

CEP 670 Wastewater Treatment Modeling

Water Modeling for Physical Properties, Chemical & Biological Actions with Hydraulic Equations, Applied Models for Primary Treatment Methods, Attached Growth Biological Treatment, Suspended Growth Biological Treatment, Stabilization Ponds, Aerated Lagoons, Anaerobic Treatment, Chemical Treatment, Treatment with Activated Carbon.

CEP 671 Water Supply Systems Modeling

Water Modeling for Physical Properties with Hydraulic Equations, Applied Models for Water Supply Networks Planning, Water Piping Systems Hydraulic Design, Water Supply Pipes Materials, Appurtenance of Water Supply Pipes, Pumping Stations, Design of Carrier Lines, Water Hammer, Test of Water Lines, Valves & Control of Water Supply Networks.

CEP 672 Sewerage Systems Modeling

Water Modeling for Physical Properties with Hydraulic Equations, Applied Models for Planning of Collection System, Hydraulic Design of Gravity Sewers, Sewers Materials, Appurtenance of Sewers, Biological Decomposition in Sewers, Pumping Stations, Design of Force Mains, Water Hammer in Force Mains, Test of Sewers.

CEP 673 Special Topics in Environmental Engineering

Environmental Laws, Water Quality and its Pollution Environmental Impact, Wastewater & Its Reuse & its Environmental impact, Reuse of Industrial Wastewater & Its Environmental Impact, Ground Water Contamination, Surface Water Pollution, Water Pollution Control Engineering, Air Quality & Its Pollutiom Environmental Impact, Air Pollution Control Engineering.

CEP 674 Networks Operation & Maintenance Programs

Main Requirements for Operation of Water Supply & Sanitation Networks, Performance Evaluation for Networks, Evaluation & Follow up of networks operation, Periodical Operation Programs, Periodical Maintenance Programs, Environmental Impacts.

CEP 675 Sea Water Desalination

Need to Desalination, Properties of Fresh & Saline Water, Engineering and Economic Considerations, Methods of Desalination, Problems Common to Distillation, Multiple Effect Distillation, Multiple Stage Slash Distillation, Vapor Compression Distillation, Combined Distillation Plants, Distillation with Non-Fuel Energy Sources, Ion Exchange, Electro-Dialysis, Reverse Osmosis, Design of Desalination Plants.

CEP 676 Reuse of Treated Wastewater

Methods of Domestic Wastewater Ruse, Environmental Impact for Domestic Wastewater Reuse, Methods of Industrial Wastewater Ruse, Recycling of Industrial Wastewater, Environmental Impact for Industrial Wastewater Reuse.

CEP 677 Reuse of Solid Wastes

Methods of Domestic Solid Wastes Ruse, Environmental Impact for Domestic Solid Wastes Reuse, Methods of Industrial Solid Wastes Ruse, Recycling of Industrial Solid Wastes, Environmental Impact for Industrial Solid Wastes Reuse, Methods of Agricultural Solid Wastes Ruse, Environmental Impact for Agricultural Solid Wastes Reuse.

CEP 678 Sludge Disposal & Reuse

Sludge Disposal in Water Treatment Plants, Sludge Disposal in Wastewater Treatment Plants, Sludge Disposal in Industrial Wastewater Treatment Plants, Methods of Sludge Reuse, Environmental Impact for Sludge Reuse.

CEP 679 Industrial Water Supply

Water Different Uses in Industry, Problems Associated with Industrial Water Supply, Treatment of Boiler Water, Cooling Water Circuits, Industrial Water Supply for Metallurgical Industry, Paper Industry, Food Industry, Agricultural Industry, Textile Industry, Chemical and Pharmaceutical Industry and Other Industries, Reuse and Recycling of Industrial Water.

CEP 681 Traffic Flow Theory and Engineering Applications

Elements of Traffic Flow, Traffic Measures and Distributions, Mathematical Models of Traffic Flow, Measurements of Traffic Variables, Shock Wave Theory, Simulation of Traffic Movements, Optimization of Traffic Signals, Critical Movement Analysis, Freeway Traffic Control.

CEP 682 Traffic Operations and Control

Urban Congestion and Causes, Traffic Control Measures, Freeway Surveillance and Incident Detection, Simulation of Traffic Behavior, High Occupancy Vehicle Systems, Integrated Traffic Management Systems, Strategies for Urban Mobility.

CEP 683 Statistical Applications to Traffic Operations

Introduction to Statistical Distributions, Sampling Procedures and Sample Size, Speed Statistical Distributions, Urban and Intercity Distribution of Traffic Flow, Headway Distributions, Statistical Significance of Traffic Improvements.

CEP 684 Traffic Studies and Analysis

Introduction to Linear and Non-Linear Systems and Models, Traffic Composition and Characteristics, Survey of Traffic Flow, Speed and Travel Times, Delay Studies at Intersections, Parking Studies, Traffic Measures of Performance, Evaluation of Traffic Operations.

CEP 690 Utilities Networks Planning & Its Economy

Types of Utilities Networks, Water Supply Distribution Networks Types, Sewerage Systems Types, Basics of Urban Planning, Planning of Water Supply Networks for different purposes, Planning of sewerage systems, Intersections with gas, Electricity & Communication networks, Public Utilities Economy.

CEP 691 Engineering Economics

Equivalence, Interest Factors and Problems, Annual Cost Method, Present Worth Method, Rate of Return Method, Benefit to Cost Ratio Method, Income Tax, Depreciation, Choice of Growth Factors, Multiple Alternatives, Sensitivity Tests, Expected Cost, Increment Cost, Sunk Cost, Source of Funds, Cost Effectiveness Method.

CEP 692 Advanced Environmental and Social Studies

Advanced Studies on The Following Topics: Studying of Main Factors Officiating The Environment, Environment Problems, Studying The Socio-Economic and Physical Characteristics for Study Area That Affects The Future Plan of Infra-Structure Projects. Methods for Population Prediction in The Future, Environment Impacts of Infrastructure Projects, Environmental Law and Their Suitability for The Protection of The Environment.

CEP 693 Railway Economic and Management

Public transport system by Railway, Urban and rural Railway systems components, Infrastructure of Railway, Advanced studies concurring management of Railway projects executing, Applied studies on Railway projects managements, Risk analysis and its applications on the Railway field.

CEP P99 Project

5. Department of Architecture Engineering

ARC 501 Professional Practice

An Introduction to Profession Morals and Ethics, Architectural Professional Duties and Responsibilities, Management of The Architectural Organization and The Architectural Projects, Attaining Quality Performance, Controlling Cost, Financial Commitments, Time Schedules, Cooperation and Relationship with Professional Institutions and Client, Professional Services Marketing, Social Responsibilities, Setting Up Contracts and Agreement Letters, Agreement Commitments, Revising Records and Improving Means of Correspondence, Legal Responsibilities, Compensations, Attribution, Law Suits and Reconciliations.

ARC 502 Report Writing

An Introduction to Reports' Objectives, Kinds, Basics and Methods of Writing, Means of Setting Report Objectives and Components, The Importance of Components' Independency and Systemization and The Means to Achieving That, Means of Setting The Sequence of Contents, Organizing an Writing The Results with Clarity, Setting Up Schedules, Graphs and Statistics, Organizing Demonstrative Figures in Terms of Dimensions and Distribution Throughout The Report, Presentation.

ARC 503 Human Sciences

Identifying The Perceptive Qualities of Building Design, As Space and Finishing Materials, and The Properties of The Surrounding Environment, Analyzing The Most Eminent Human Issues and Social Values That Are Related to The Architectural Product, Studying The Reflection of Vital Activities on The Formation of Architectural Spaces, Identifying The Mutual Relationship Between The Building and The Users' Conduct, Applying The Role of Cultural Changes on The Conceptualization of Contemporary Local Urban Form.

ARC 504 Computer Applications

Computer Has a Main Utility Through Feeding Information, Analyzing Architectural Data, Data Base, and Geographic Information System: GIS, Recognizing The Different Ways of Data Analysis for The Architectural and Planning Applications.

ARC 506 The Project

Complete Detailed Study for an Architectural Project Either Executed Or Ready for Execution Including :Revision and Evaluation of The Design Concept of The Project, Setting Up The Working Drawings for Its Elements and The Detailed Drawings of Its Different Levels, General Conditions, Technical Conditions for The Construction Execution of Works, Time Schedules for Execution Stages….etc, According to The Quality Control Criteria, Monitoring Possible Defects and The Means of Overcoming It.

ARC 521 Environmental Design and Energy Conservation

Introduction to Environmental Design, Principles of Green and Sustainable Architecture and Their Role in Energy Conservation, The Application of Solar Energy in The Passive Design of Buildings, Design Techniques for Passive Cooling and Passive Heating, Analyzing Applied Examples, Optimizing The Integrated Application Of: Passive, Low-Energy and

Active Cooling Methods in Building Design to Achieve Maximum Efficiency in Energy Conservation.

ARC 522 Lighting in Buildings

Daylighting As Part of The Environmental Considerations in Buildings, Objectives of Daylighting, Factors Affecting The Illuminance Due to Daylighting Indoors Apertures. Methods of Analyzing Daylighting, Quality of Light and Glare Phenomenon, Innovative Systems for Daylighting Control. Integration of Daylighting & Artificial Lighting. Artificial Lighting Systems.

ARC 523 Thermal Environment in Buildings

Bioclimatic Approach for Design, Thermal Comfort Measurements, Climatic Regions in Egypt, Environmental Strategies in Different Regions, Identifying Design Objectives with Respect to Thermal Comfort and Methods of Achieving Them: Building Form, Orientation, External Surfaces Treatments. Thermal Transition Through Building Envelop. Design Parameters and Treatments for Thermal Comfort, Introduction on Energy Conservation in Buildings As One of The Most Important Goals of The Ecological Architecture.

ARC 524 Building Acoustics

Definition of Building Acoustics, Characteristics of Sound Waves and The Decibel System. The Behavior of Sound Waves in Enclosures, Reverberation Time RT. Some Acoustical Defects and Its Correction, The Objectives of Acoustical Design in Auditoria, Computer Applications in Building Acoustics, Instrumentation for Environmental Noise Measurement, Loudness Perception, Noise Indices, The Effect of Noise on People: Noise Criteria, Environmental Noise Measurement in Practice, Outdoor Noise Prediction, Noise Control, Planning to Control External Noise and Internal Noise for Dwellings.

ARC 525 Economic Energy Techniques in Buildings

Introduction on Applied Energy Techniques in Buildings, Ventilation Systems, Comparison Between Different Air Conditioning Systems (Efficiency, Levels to Be Attained, Operation, Maintenance, Improving Performance to Reduce Energy Consumption), Water Supply, Electric Power Systems, Reduction in Energy Requirements for Electric and Mechanical Systems. Building Energy Management, Electronic Control Systems, Evaluation of Means of Energy Saving and Consumption Expenses.

ARC 527 Infrastructure Works

The Fundamentals of Planning Infrastructure Networks Serving Housing Areas, Including Roads, Sewage, Water Supply, Treatment Plants and Electrical Networks Putting Emphasis on Upgrading The Infrastructure of Deteriorated Urban Areas, Means of Supplying Infrastructure to Deprived Areas, Studying Infrastructure Works for New Housing Settlements and Its Construction Phases According to The Community Growth Rate, According to Available Funding , Infrastructure Maintenance and The Role of The Local Community in This Respect.

ARC 531 Tendering Procedure and Cost Analysis

Data Base and Calculation Programs, Reviewing, Analyzing and Evaluating The Tenders of Bidders, Reviewing Amounts and Units of Each Construction Stage, Defining The Highest, Lowest and Average Offers of All Construction Stages, System Benefits, Reviewing

Elements of Submittal, Execution and Delivery of Each Complimentary Activity for Each Construction Phase, Overheads.

ARC 532 Project Construction Programs

Setting The General and Detailed Construction Execution Time- Schedule, Integrating The Construction Execution and Financial Schedule, Construction Management, The Daily, Weekly, and Monthly Follow-Up of The Schedule, Daily, Weekly and Monthly Reports of The Construction Management, Reviewing The Contractor Monthly Financial Statements, Project Final Statement, Critical Path Method, Construction Orders, Refusing and Amendment and Their Results, Preliminary and Final Handing Over of The Project.

ARC 533 Principles and Basics of Handing Over Constructed Work

Specifying The Sort of Handing Over During Construction, Phases, Preliminary and Final Hand Over, Setting Time Schedule for Phases Handing Over During Construction, Partial and Total Hand Over of Building, Preliminary Hand Over of Works, Handing Over Statement.

ARC 534 Operation and Maintenance of Building Facilities

The Facility Hand Over, Partial Operation of Building, Works Inspection, Total Facility Operation and The Conditions of Maintenance Efficiency, Setting Maintenance Schedules and Checklists, Time Cycle, Maintenance Team Selection, Periodic Maintenance, Emergency Maintenance, Basic Maintenance, Costs and Expenditures.

ARC 535 Evaluation of Projects After Occupancy

Evaluation of Fundamentals and Criteria Upon Which The Project Was Designed and Constructed. Identifying The Defects –If Any- and Considering Means of Recovery. Evaluation of The Project Upon Achieving The Functional Objectives It Was Built for and The Means of Adjusting The Relationship Among Project Elements.

ARC 541 Urban Sociology

Concept of Urban Sociology As an Approach to Emphasizing The Importance of Human Sciences and Social Factors to The Existing and New Architectural Projects, Recognizing The Social Indications of The Historical Development and Properties of The Social Structure of Cities and Urban Areas, Urbanism and Immigration from Rural to Urban Areas, Identifying The Social Attributes of Informal Settlements, Emphasizing The Importance of Environmental Backgrounds and Traditions in The Development Stages of Deteriorated Areas in General and Informal Areas in Particular.

ARC 542 Urban Upgrading

Upgrading The Built Environment of Urban Areas for Both Formal and Informal Housing Settlements, Old Downtown Districts, Or Those on The Outskirts of The City, Upgrading of Rural Settlements, The Concept of Comprehensive Upgrading As an Urban, Social and Economical Approach to Treating Deteriorated Settlements, Studying Developing Countries' Experiences in Urban Upgrading Projects, Studying The Egyptian Experience in The Upgrading of Informal, Urban Or Rural Communities, Identifying The Role of Different Authorities in Upgrading Projects and Means of Coordination Between Them to Achieve The Project Goals.

ARC 543 Housing Studies

Designing Housing Communities Starting from Regional Studies Needed to Identify The Housing Development Areas, The Sites for New Towns, Targeted Inhabitants, The Social and Economical Structure of The Housing Settlement, Means of Identifying Land Use, Proportion, Urban Standards for Services, Housing Types Appropriate for Different Social and Economical Categories, Identifying The Basics of Land Subdivisions and Their Proportions and Building and Legal Rules and Regulations, Different Approaches for Setting Housing Types Through Studying Urban Spaces, Environment and Landscape of The Site.

ARC 544 Low Income Housing

Introducing Successful Experiences of Low Income Housing Prototypes in Second World Countries, Financing Low Income Housing, International Experiences in Low Income Housing, Case Studying The Low Income Housing in Egypt (Economy Housing, Low Cost Housing, Youth Housing, Site and Services Projects, Core House), Selecting Targeted Beneficiary Groups, The Role of State NGOs and The Community in Supplying Low Income Housing Projects.

ARC 545 Post Occupancy Evaluation of Housing Projects

The Fundamentals and Criteria of Evaluating Housing Projects After Occupancy Through Studying Social Aspects of The Inhabitants and The Appropriateness of The Residential Buildings to The Targeted Group Needs and Affordability, Means of Management and Maintenance of These Projects After Construction and The Role of The Community in Preserving These Housing Projects.

ARC 601 Principles of Scientific Writing

An Introduction on The Origins and History of Scientific Writing. Definition and Organization of a Scientific Paper. Importance of The Title and How to Prepare and Specify It. Types of Abstracts and How to Prepare It. How to Write The Materials and Methods Section. How to Write The Results and Its Content. How to State The Acknowledgments.Reference Styles and How to Cite Them. When to Use and How to Design Effective Tables. How to Prepare Effective Illustrations (Size and Arrangement of Graphs and Photos).How to Present a Paper Orally.Ethics, Rights and Permissions and The Importance of Originality.

ARC 603 Scientific Methodology

Researcher Characters and Morals, Ethics in Scientific Research, The Importance of Research Methodology, Methods of Data Collection, Notes on The Scientific Writing, Science, Scientific Performance and Its Objectives, Scientific Research (Definition of Scientific Research, Conditions of Scientific Research, Features of The Subjects in Scientific Research, Fields of Scientific Research in Architecture, Definition of The Problem, Hypothesis and Assumptions, Problem Mechanism, Examples), Scientific Methodology (Objectives of The Scientific Methodology, Features of The Scientific Methodology, Mechanism of The Scientific Methodology), Inference Definitions and Parts, Mistakes in Scientific Research.

ARC 605 Humanities in Architecture

Architecture and Human, The Human Dimension in The Articulation of Architectural Space, The Concept and The Assumptions, Architecture from a Perceptive Point of View, Form, Felt

Impressions of Form, Expression and Space Elements, The Mutual Impacts of Architectural Space and Human Behavior, The Architectural Space As an Indication of Culture and The Change in Cultures As an Indication of Architectural Space, Reading The Cultural Reality, The Human in The Architecture of Past, Present and Future, Identification of The Human Dimension of Local and International Architectural Models.

ARC 611 Studies in Criticism

The Controversy of Architectural Debate Issues Between Concept and Aspiration, The Basics of Referential Assessment of Architectural Projects, The Criteria of Architectural Criticism According to Conventional Physical Rudiments and Unsettled Metaphysical Visions, The Technological Impact on Architecture and on The Architectural Thought of Respective Pioneers, Identifying The Position of Local and Regional Architecture with Respect to International Architecture.

ARC 612 Historicism in Architecture

Architecture and History, Architecture As a Tool for Recording History, History As Meaning, Generation, Imprint, Memory, Culture, History and Heritage, Heritage As a Tool, Identity and Expression, Expressions of Different Eras, The Present As The Future of History, Historical Continuity, Observing Architecture from a Historical Perspective.

ARC 613 Contemporary Architectural Thought

This Course Deals with Theoretical Transformations in Architectural Theories, Starting from Renaissance to Post-Modernism, Late-Modernism and Deconstruction. It Examines Various Architectural Trends, Including Humanistic Architecture and Its Interpretations, High-Rise Buildings and Its Special Construction Systems, with Practical Applications and Analytical Studies.

ARC 614 Philosophical Investigations in Architecture

This Course Is Concerned with Philosophical Concepts in Architecture and Design. It Integrates with Hypothetical Theories of Architectural Design. It Also Deals with Advanced Construction Systems and The Utilization of Information Technology, and Their Reflection in Architecture Philosophy. Then The Morphic Changes in Architectural Thought Are Traced, to Examine Its Reflection on The Formation of New Theories of Innovative Architectural Design.

ARC 615 Architectural Criticism

This Course Deals with Innovative Trends That Merge Criticism, Creativity and Imagination in Architectural Thought. It Deals Also with Its Theoretical Reflections on Theories in Criticism of The Three Main Architectural Eras in Modernism. It Starts with Mid 19th C (Machine Age and Steel Structure Technologies, Rationalism and Anti-Rationalism), Followed with Fauvism, Brutalism, Structuralism, and Structural Changes in Theory. Then It Ends with The Contemporary Era (Surface Tension, Hyper, Cyber, Hybrid Architecture and Virtual Reality). This Is Examined Through Critical Analysis of Representative Examples to Various Trends.

ARC 616 Architecture and Art

This Course Attempts to Study The Sources of Creativity on Both Theoretical and Compositional Levels. Also, The Reflections Among Nature, Man and Types of Art As Conceptual and Design Sources in Modern Architecture (Such As Literature, Poetry, Music, Sculpture, Drawing, Cinema…etc.). Also, The Development of Spatial Concepts, Architectural Expressionism, Advanced Expressionist Structural Systems. It Starts with Early Modernism (Expressionism, Impressionism, Fauvism, Art Deco, Art Nouveau, Bauhaus, and De-Stijl) Passing Through Transitional Movements (Conceptual, Minimalism, Kinetic, Deconstruction, and Pop Art). Finally It Reviews Contemporary Movements (Such As Gestural Abstraction, Bio-Morphic Geometrical Abstraction, Tectonic Fractal, Figurative Expressionism, Installation and Digital Art), Where The Boundaries Between Art and Architecture Dissolve Environmentally in The Age of Information Technology.

ARC 618 Architectural Program

Means of setting an integrated architectural program determining the project's main elements, functional spaces, services and the appropriate area for each element: the evaluation of the preliminary architectural program provided by the owner and the fulfillment of its main and complimentary elements, matching the outcome with the international design criteria, reviewing the international and local codes concerning different spaces, fulfilling local building rules and regulations.

ARC 621 The Arab Contemporary Architecture

The Course Is Divided Into Two Parts, The First Deals with The Change in The Historical Perspective of The Arab World Architecture According to Its Geographical Setting, The Role of The Environment, Sociological Aspects and Beliefs in Setting The Formal Language of Arab Countries, The Impact of Traditional Formal Basis and The Regional Culture on The Contemporary Architectural Schools of Thought in These Countries, and Identifying The Effect of The Contemporary International Changes Through The Last Three Decades of The Previous Century on Changing The Urban Features and The Architectural Approaches in The Region. The Second Part Features The Egyptian Architecture As a Perfect Representation of The Arab World Architecture Due to Its Affluent Vernacular Formal Language, Considering The Role of Cultural, Social and Technological Changes on The Contemporary Architectural Product.

ARC 631 Environmental Control

An Introduction to The Conception and Importance of Environmental Control and Its Influence on The Design of Buildings Through Studying Three Environmental Sciences, First, Thermal Environment: Bioclimatic Analysis of The Climatic Regions in Egypt, Environmental Design Strategies in Climatic Regions, Thermal Behavior for Materials, Thermal Exchange Between Buildings and The External Environment, Air Movement in Urban Spaces, Air Flow Control Inside Buildings. Second, Lighting Environment: Importance of Daylighting, Daylighting Requirements Inside Buildings (Illuminance, Daylighting Distribution and Relationship Between Brightness Levels), Lighting Quality and Visual Comfort Requirements, Innovative Daylighting Systems, Integration Between Daylighting and Artificial Lighting. Third, Acoustics Environment: Acoustics Design Requirements Inside Spaces Especially Auditoria, Sound Transition, Properties of Sound Absorption Materials, Noise Control, Sound Isolation, Acoustics Architectural Treatment of Acoustics in Buildings.

ARC 632 Fundamentals of Energy Conservation

Means of Energy Conservation in Buildings, Buildings Requirements for Energy, Systems of Energy Conservation on The Phases Of: Preliminary Design Project Phase, Construction Phase and Operation and Maintenance Phase, Building Envelope and Openings Techniques, New and Renewable Energy Techniques in Buildings, Design Parameters and Applications.

ARC 633 Environmental Impacts of Projects

Direct and Indirect Positive and Negative Influences of Architectural and Urban Projects on The Environment, Whether Economical, Social, Cultural Or Aesthetic, Means of Avoiding Dissipating Natural Resources, Polluting The Environment and Endangering The Ecological System, Environmental Considerations in The Design Phase and The Construction Phase, Respect for The Site and The Users, Using Whole Design Process, The Evaluation of Local and International Experiences to Avoid The Negative Impact of Projects on The Environment and Identifying The Approved Rates for The Compatibility of The Projects with The Environment.

ARC 634 Advanced Technical Installations

Specifications and Conditions for Electric Technical Installations in Buildings (Wires, Cables, Connection Boxes, Primary and Secondary Distribution Boards, Protection Elements, Electric Outlets …etc) Internal Communications, Fire and Burglary Alarm Systems, Air Conditioning Systems, Lightning Protection System, Elevators and Escalators, Operation and Control Systems and Applying Conditions. Defining Innovative Techniques and The Main Principles of Technical Systems in Buildings (Electronic Control Systems, Materials and Installations) and Their Influence on Contemporary Architecture.

ARC 635 Architectural Restoration

Concept of Restoration, UNESCO Recommendations Concerning Restoration, The Special Cases in Building Restoration, Restoration Processes for Different Materials, Innovative Practices in Accurate Preservation of Complementary Artifact, Ornaments, Sculpture and Drawings. Restoration of Different Building Materials, Disassembly, Storage, Reassembly, The Building Safety Measures, Structural Continuity, Basis of Accurate Restoration of Ornaments, Sculptures and Murals.

ARC 641 Feasibility Studies of Architectural Projects

Site Characteristics, Legal and Physical Constraints and Potentials, Area, Site Description and Value Including Infrastructure, Project Program, Elements, Description, Resources, Area and Physical Characteristics(Floor Area, Number of Floors, Height),Total and Detailed Cost of Project Elements, Finance, Time Span, Revenue, Estimated Life Time.

ARC 642 Management of Architectural Projects

Methods of Management and Development of Housing Communities and Urban Projects, Management of Upgrading Projects, The Organizational Structure and Authorities in Charge of Applying Upgrading Policies, Management and Development of New Sustainable Housing Communities Through Follow Up and Evaluating Its Construction Phases, Maintenance of Housing After Construction and The Role of The Community and Authorities in Funding and Maintaining These Projects.

ARC 643 Performance Evaluation and Maintenance of Buildings

Comparing Actual Building Performance with Anticipated Design Performance, Required Considerations Through The Design Stage. The Process of Evaluating The Performance of Buildings. Strategies and Philosophies of Maintenance, Suitable Control and Operation, Fault Detection, Causes and Analysis, Safety and Environmental Maintenance, Operational Techniques in Maintenance, Decision Making Techniques, Resource Management, Measures of Maintenance Effectiveness, Computerized Maintenance.

ARC 644 Value Engineering

The Concept of Value and Means of Its Administration, Methods of Value Measurement, Estimation of Costs and Economical Analysis in Value Management and Its Phases: Analyzing The Elements Function, Components and Cost, Presenting Alternatives for Carrying Out These Functions with a Minimum Overall Cost, Creativity, Evaluation and Selection, Minimizing Expenditures and Maximizing Usage of Financial Resources, Fulfilling Value Requirements and Getting Rid of Unnecessary Expenses, Solving Problems Without Affecting Value Or Performance.

ARC 651 Physical & Urban Upgrading

The Course Aims to Classifying The Deteriorated Communities in The Urban Areas, Its Reasons and Its Physical, Socio-Economic Characteristics. The Course Deals with The Methods of Improving These Communities with Focusing on The Upgrading Process As an Integrated Approach and The Methodology of Physical Improvement Taking Into Consideration The Community Participation As a Major Item to Guarantee The Upgrading Success.

ARC 652 Upgrading of Historical Sites

Identifying Historical Sites in Need of Upgrading, The Old City According to The Athens Agreement, Different Conservation Conditions, Examples from East and West, Conserving Mediaeval Cairo, Historical Sites Considered By The UNESCO As World Heritage, The Impact of Historical Areas on Tourism and The Means of Avoiding Negative Issues, Finance and The Regional and International Campaign for Raising Funds for World Heritage Conservation

ARC 653 Community Participation

Methods of Community Participation in Projects, Means of Encouraging The Community Role and The Informal Productive Sectors in Upgrading and New Settlement Projects and The Role of NGOs in These Projects, The Organization Structure for The Management of Housing Projects and The Community Role in Managing Their Area on Both Decision Making and Project Execution Levels , Maintenance of These Projects, Defining The Role of Women in Participation in Upgrading Projects, Improving The Deteriorated Urban Communities and New Communities Housing.

ARC 654 Housing Policies & Strategies

The Course Deals with The Housing Policies in Different Countries, Especially The Low-Income Groups in Developing Countries Such As: The Governmental Housing, Co-Operatives Housing, Private Housing and Informal Housing. The Evolution of Housing

Policies in Egypt Taking Into Consideration The Role of Governmental and Non-Governmental Organizations and Re-Secure Mobilization in Housing Process.

ARC 655 Housing in Developing Countries

Social, Economical and Urban Features of Housing Projects in Developing Countries Management of Housing Projects, Different Sources of Finance, The Environmental Dimension for Housing Projects in Developing Countries, The Role O Non Governmental Organizations and Universities in Housing Projects Execution, Community Participation in Low Income Housing, Presenting Urban Upgrading and Housing and Services Projects.

ARC 656,657 Seminars 1 &2

Open Seminar Sessions in The Field of Research Steered By Supervision Committee Through Which The Student Can Be Directed to Readings Or Courses Within Or Outside The Specialization. In Case The Student Achieves 3 G.P.A After 12 Credit Hours Through The First Phase of The Ph.D. Program, He Has The Right to Start Directly with His Dissertation, and in This Case Seminars 1&2 Can Be Directed Towards The Research Structure. The Year Work of These Courses Would Be Graded According to Each Case Individually.

6. Department of Urban Planning

UPL 501 Management of Urban Development

This Course Introduces Concepts of Managing Urban Development and The Major Challenges Facing Development. a Comprehensive Review of Urban Development Is Addressed. in Addition The Course Reviews International Management Methods and Reviews The Different Applications to Achieve The Maximum Benefit and Adapting to The Context of Developing Cities.

UPL 502 Introduction to Urban Planning

This Module Introduces Growth Potential and Land Use Alternatives for Urban Regions, Theories and Models Concerned with Urban Spatial Structure, Theories and Models Concerned with Urban Spatial Structure, Location Behavior of Commercial, Industrial, Residential, and Governmental Users of Space, Demand for and Allocation of Space Within Urban Areas.

UPL 503 Planning of Residential Areas

This Course Introduces Various Methods of Planning Residential Areas of Different Levels and Different Types It Emphasizes The Role of Social and Economical Dimensions of The Society in Shaping Residential Areas. Students Acquire Hands on Experience in Analyzing Data and Survey Results in Preparing Urban Plans. a Comparative Analysis of Different Examples of Existing Residential Areas and Projects Will Be Reviewed and Criticized.

UPL 504 Squatter Areas in Third World Countries

This Is an Introductory Course to Squatter Settlements. It Offers a Study of The Situations in Existing Squatter Areas. It Address Two Main Inquiries, Where and Why Squatter Settlements Are Located. It Will Review Methods of Urban, Social, Economical, Environmental Survey for These Areas. a Comparative Study of Different Squatter Settlements Will Be Conducted.

UPL 505 Remote Sensing Applications in Urban Planning

The Purpose of This Course Is to Develop a Complete Understanding of The Concepts and Techniques of Aerial Survey and Remote Sensing and an Interpretation of Maps and Spectral Signatures of Minerals, Water, Vegetation, and Man-Made Materials. It Utilizes Applications of Remote Sensing Technology for Addressing Topics and Problems in Planning and Develops Methodologies for Applying Remotely Sensed Data Translates Into Finding Practical Solutions to Urban Questions At National, Regional, and Local Scales. Establish Strategies for Integrating Remote Sensing Data Interpretations Into Multilayered GIS Analyses.

UPL 506 Planning of Infrastructure Networks

Infrastructure's Aim and Objectives. Description of All Essential Services and Utilities Including electricity, Gas, Water Supply, Sewage System, Storm Network, Solid Wastes Disposal and Telecommunication. Design Basis of Infrastructure Planning. The Impact of Infrastructure Networks on Environment, Public Health and Safety, Environmental Laws and Regulations Governing Infrastructure Networks.

UPL 507 Field Studies and Analyses

Analysis of Urban Projects After Implementation and Assessment of Performance From Different Viewpoints.

UPL 508 Applied Studies

Application of Planning Methodology: Theory, Case Studies Concepts, Principles, Processes and Techniques to a Selected Realistic Problem, Issue, Or Project Context At an Appropriate Scale Ranging From The Neighborhood to The State. The Intent Is to Sharpen The Student's Skills in Report Preparation, Oral and Visual Presentation of Complex Issues, Preparation.

UPL 509 Urban Design in New Districts

This Module Introduces Applied Concepts of Urban Design in New Districts, and Housing Projects in New Cities Or Settlements. It Analyzes Existing Conditions in New Settlements to Assess Their Success in Achieving The Proposed Goals. The Course Reviews International and Local Examples of Urban Projects. Practical Approaches in Evaluating and Planning Sites Within The Contexts of Natural, Economic and Cultural Systems. Site Inventory, Analysis, and Planning. Introduction of Computerized Platforms, Integrating Digital and Physical Representations to Enhance Planning and Communication with The Public.

UPL 510 Computer Applications in Urban Planning

This Course Offers 'Hands On' Experience Using GIS Software to Provide Experience Solving Problems Related to Planning Issues. It Introduces Uses and Methods of Spatially Related Information and Land Records Systems for Improved Productivity and Decision Making in Service Delivery, Management, Policy-Planning, and Land Development Methods. Examination of Selected Computer Application in Planning Topics Including Spreadsheet and Database Models, Geographic Information Systems, and Desktop Publishing and Their Applications to Urban and Regional Planning Topics.

UPL 511 Introduction to Urban Design

The purpose of this course is to provide an overview of definitions and concepts of urban design. It presents students with tools of perceiving streets, buildings, hierarchy of streets, concepts of space and place. The intent is to be able to better question architectural projects and consider the impact of development. Students will be able to understand the different scales of representation: buildings, streets, land uses, urban park development, and anything else that is woven into the fabric of a town. Topics discussed will include: physical comfort – circulation and accessibility – transitions and boundaries – connection between street and building – scale – detail, variety, and complexity

UPL 512 Townscape

Focus Is on How The Influence of Given Urban Structure and Appearance As Well As Building Materials, Texture and Color Can Be Considered for Existing and New Design Projects.

UPL 513 Man and environmental Control

Impact of Physical Environment on Man, Bio-Climatic Analysis for Climatic Regions, Use of Bio-Climatic Chart, Use of Sun-Path Diagram, Thermal Behavior of Materials, Thermal Exchange Between Buildings and Environment, Air Movement in Urban Spaces, Strategies

of Environmental Design for Climatic Regions, Requirements of Comfort in Luminous Environment, Design Guidelines for Natural Lighting, Supplementary Artificial Lighting, Requirements of Acoustic Design, Sound Transmission, Insulation Design Principles and Architectural Treatment for Building Acoustics.

UPL 514 Pollution and the Built Environment

This Course Defines Environmental Quality and Introduces The Environment As an Important Factor in The Planning Process. It Reviews The Causes of Environmental Problems (Pollution, Environmental Degradation, Dissertation, Erosion), and The Political and Economical Challenges and Conflicts of Environmental Analysis. It Provides Deep Analysis Into The Causes of Environmental Pollution.

UPL 515 Introduction to Environmental Sciences

This course aims at providing students with fundamentals of Environmental Science including multidiscipline aspects required to establish an environmental inventory for any specific area. It provides background on fundamentals in Geology, Ecology, Soil, Air Quality, Water Quality, Waste Management and Noise.

UPL 601 Urban Planning: Theory and Practice

This Module Explores Strategic Interventions in Urban Development Policy, Planning and Management with Specific Reference to Social Justice in Cities. in This Light, It Reviews The Evolution of Urban Development Interventions and Defines The Theoretical and Methodological Challenges Which Face Contemporary Urban Development in Different Parts of The World. Theories About How Planners Should Act in The Planning Process. Topics Discussed Will Also Include: History, Values, and Ethics of The Profession, Methods of Participation, Power in Planning. It Also Assesses a Range of National and International Case Studies of Urban Development Practice, and The Application of These Processes to Formulate and Critique Urban Plans and Policies.

UPL 602 Advanced Spatial Analysis

This Module Explores The Purpose and Classifications of Spatial Analysis As The Process of Extracting Or Creating New Information About a Set of Geographic Features to Perform Routine Examination, Assessment, Evaluation, Analysis Or Modeling of Data in a Geographic Area Based on Pre-Established and Computerized Criteria and Standards. It Introduces Different Advanced Analysis Such As: Designing Multi Criteria Analysis, 3D Analysis, Suitability Analysis, Risk Analysis, Fragmentation Analysis, Spatial Overlay and Contiguity Analysis, Surface Analysis, Linear Analysis, and Raster Analysis. It Includes Such GIS Functions As Topological Overlay, Buffer Generation, and Spatial Or Network Modeling. It Also Introduces Different Software and Techniques of Networking and Space Syntax.

UPL 603 Quantitative Analysis

This Course Introduces Basic Concepts of Statistical Analysis, and The Application of Quantitative Methods Used in Urban Planning and Analysis of The Built Environment. Topics Will Include: Frequency Distribution, The Graphical Representation of Data, Measures of Central Tendency, Dispersion and Variability, Normal Distribution, Analysis of Variance, Covariance, Confidence Intervals and Population Variance, Hypothesis Testing and Significance Tests, Correlation, Simple and Linear Regression, The Use and Interpretation of

Multivariate Data and Data Management and Analysis Using Statistical Software. Topics Include Survey Design, Demographic, Economic, and Socio-Economic Projection Techniques, Use of Cohort Survival, and Other Techniques in The Analysis of Trends for The Purpose of Forecasting The Components and Location of Population, Housing, Jobs, Income, Consumption, etc.

UPL 604 Introduction to Economic Theory

This Course Provides an Introduction to Neoclassical Microeconomics Applicable to Analysis and Evaluation of Private/ Public Development and Urban Form. Theories of Marginal Analysis, Present Value, and Applied Optimization Explain Urban/Environmental/International Economics, Public Choice, Location Theory, and Development Economics. Macroeconomic General Equilibrium Paradigm Explains Suboptimal Resource Allocations, Or Market Failures, Leading to Variety of Market Interventions.

UPL 605 Contemporary Theories of Urban Design

This Course Provides an Overview of Contemporary Theories and Modes of Critique Relating to Urban Design. It Introduces The Six Key Dimensions of Urban Design Theory and Practice: The Social, Visual, Functional, Temporal, Morphological and Perceptual. Emphasis Is on How Urban Physical Form Responds to The Economic, Cultural, Political, Social, Aesthetic and Natural Forces of an Urbanized Area. Themes Discussed Will Include: Place Making, Lost Space, Infill, Placelessness- Identity of Place- Public Policy and Professional Practice and Implementing Urban Design.

UPL 606 Eco-Urban Design

This Module Offers The Opportunity to Study Many Aspects of The Environment From an Urban Design Point of View and Addresses Ways of Minimizing The Impact of Buildings on The Environment. It Emphasizes The Relationship Between Human Behaviour and Needs and The Visual and Physical Form of Urban Environments, While At The Same Time Investigating The Influence and Potential of Sustainable Processes on Urban Form. Topics of The Module Include Heat Transfer in Building Systems, Bioclimatic Design Issues, Airflow in and Around Buildings, Ventilation and Indoor Air Quality, Passive and Active Heating, Cooling, and Ventilating Systems, Energy, Lighting and Acoustics. These Principles Are Applied At The Buildings-Scale to Understand How Global and Local Environmental Problems Impact Urban Design.

UPL 607 Urban Conservation

This Module Is Designed to Introduce The History and Theory of Architectural and Urban Conservation and to Uncover The Operation Guidelines of Current Conservation Practice and Heritage Management. The Course Aims At Understanding The Ideas Underpinning Architectural and Urban Conservation, Recognising The Relationship Between Such Ideas and Principles of Practice That Have Developed (As Expressed in National and International Charters), and The Processes of Identifying Heritage Resources and Assessing Their Significance. It Also Assesses a Range of National and International Case Studies of Urban Conservation Practice.

UPL 608 Environmental Impact Assessment

This Module Provides a Review of EIA History. It Offers an Identification of EIA Methodology, and Highlights The Role of Public Participation in EIA. It Discusses Considerations of Environmental Impact Report. It Provides an Analysis of EIA Case Studies and Reviews The Conditions of EIA Practices in Egypt.

UPL 609 Management of Urban Environment

This Course Provides a Definition of The Urban Environment and Factors Affecting The Urban Environment, It Discusses The Key Environmental Issues in Urban Areas, Environmental Management Considerations. It Offers a Review of The Tools of Environmental Management.

UPL 610 Sustainable Urban Development

This Module Discusses The Current Debates on Sustainable Urban Development. It Reviews The Evolution of The Concept and Defines Weak and Strong Sustainability. It Discusses The Objectives, Challenges, Constraints and Principles for Sustainable Development. It Explores The Relationship Between Economy, Ecology and Equity and Explains What Is Meant By a Sustainable City. The Module Analyzes Best Practices of Sustainable Development Projects From Around The World to Draw Lessons and Identify The Theoretical and Methodological Challenges Which Face Urban Development.

UPL 611 Urban Upgrading of Informal Areas

This Module Introduces Non-Traditional Concepts and Approaches to Dealing with Squatter Settlements. It Provides a Methodology for Classifying Squatter Settlements and Their Typologies. It Introduces The Concept of "The Path of Least Resistance" As The Indicator of Direction of Growth of a Squatter Settlement, and Suggest Ways of Dealing with This Course As an Attempt to Control Unplanned Growth. The Course Reviews Techniques and Advantages of Upgrading. It Discusses The Role of Public Policy and Its Impact on Housing and Governmental and Non-Governmental Interventions That Have Been Made in The Recent Years to Help Deal with Squatter Settlements.

UPL 612 City Vision and Strategic Planning

This Module Explores The Visioning Process As a Detrimental Factor for The Success of Cities to Become More Prosperous and Provide Sustainable Livelihoods. It Will Look At The Different Mechanisms Which Cities Apply to Attract Businesses and People. While Looking At Examples of Visioning in Different Cities, The Module Will Focus on Five Themes: Livelihood, Environmental Quality, Spatial Form, Financial Resources and Governance. It Will Identify The Methodological Steps for Establishing The City Development Strategy Including The Initiation Phase, Identifying The Scope, The Initial Assessment, Formulating a Vision, Identifying The Strengths- Weaknesses- Opportunities- Threats (SWOT Analysis), Setting Strategic Thrusts, Building Awareness and Implementation.

UPL 613 Construction and Tender Documents

This Module Examines The Technical Aspects of Urban Design Projects. It Provides a Critical Understanding of Construction and Tender Documents Components, Study Analysis and Evaluation of Offers, Information Feed-In of Offers, Maximum, Minimum and Average

Estimates Offers for Projects, Cost Analysis of Items of All Works, Items of Cost Analysis and Cost Trends.

UPL 614 Housing Studies

The Purpose of This Course Is to Highlight Policy Aspects of Housing Focusing on Affordability, Standards and The Evolution of Governmental Modes of Intervention. in Addition The Course Reviews New Market-Based Approaches, and The Role of State and Local Government and The Private Sector in Increasing Housing Supply. an Examination of Local Housing Markets, Their Components and Operations in The Recent Decades, and The Impacts on Them of a Variety of Public and Private Actions. Comparative Analysis Study Will Be Conducted.

UPL 615 Feasibility Studies

This Module Provides a Critical Understanding to Feasibility Studies of Urban Design Projects. It Focuses on Streamlining The Creation of The Feasibility Study in Order to Add Value to The Decision-Making Process Based on The Results of Agency Planning and Design Efforts. The Module Emphases The Role of The Feasibility Study in Supporting Resource Requests for Proposed Urban Development Investments. It Also Introduces The Concept of Time Value of Money By Incorporating Net Present Value, Internal Rate of Return, and Breakeven Analysis Financial Measures in The Suggested Format of The Cost/Benefit Analysis. Finally, It Introduces Various Formats for Clear and Concise Cost and Benefit Rationale to Assist in The Investment Evaluation Process.

UPL 616 Project Management

This Module Identifies The Fundamentals of Construction Supervision, Construction Management and Project Management. It Defines Urban Projects and Identifies Their Types, Characteristics and Their Different Stages From The Inception Stage Through The Feasibility Stage to The Strategy Stage. It Also Reviews The Code of Practice for Project Management and Identifies The Project Management Functions Such As Scope Management, Quality Management, Time Management, Cost Management, Resource Management, Risk Management and Procurement Management for Urban Projects. It Also Reviews Case Studies of Urban Projects and Analyzes Different Contract Types, Project Scheduling, Project Delivery and Project Duration.

UPL 617 Cities in the Age of Globalization

This Course Will Address The Impact of Globalization on Cities, and Explore The New Role of Cities As Sites of Economic Development and Crucibles of Civic Citizenship in This New Era. It Explores Examples of Global Cities, and Focuses on Recent Themes Such As City Vision, City Brand and Decentralization. in Addition The Course Will Address The Impacts of I.T. and Digital Era on The Urban Form and Growth of Cities.

UPL 618 Management Strategies for Rural Development

This Module Provides an Overview of Managing Change and Development Among Communities with a Particular Emphasis on Rural Development. The Class Utilizes Comparative Case Studies and Effects of Cultural and Traditional Values on Management Practices in Different Socio-Cultural Environments. It Explores The Classification of Rural and Urban Communities and Addresses The Rural Urban The Module Looks Closely At Recent Management Strategies Implemented in Egyptian Villages.

UPL 619 Regional Planning

This Module Addresses Two Fundamental Lines of Inquiry: (a) What Concepts of "Region" Are Important to The Urban Planning Process? and (b) How Do Planners Integrate Complex Systems (Such As Transportation, Human Settlements, Economic Development, Public Health) on a Regional Scale?. The Course Provides an Advanced Understanding of The Spatial, Economic, Social, Political and Physical Factors That Shape Urban Planning Regions. It Focuses on The Rationale, Techniques, and Economic, Political, and Organizational Implications of Urban Growth on Regional Planning.

UPL 620 Contemporary Trends in Urban Planning

This Module Provides an Emphasis on Exploring Ways By Which Planning Effectiveness Can Be Increased and Constraints Imposed on Planning Effectiveness Can Be Overcome. Attention Is Directed to Contemporary Approaches in Urban Planning Proposed to Achieve Greater Planning Effectiveness, and to Strategies That Public and Private Planning Agencies Follow to Achieve Greater Influence in The Development Decision-Making Process, Planning Education, Values, Ethics, and Techniques. The Module Also Illustrates a Range of National and International Case Studies of Contemporary Trends in Urban Planning.

UPL 621 Urban Governance

Urban Governance Comprises The Various Forces, Institutions, and Movements That Guide Economic and Physical Development, The Distribution of Resources, Social Interactions, and Other Aspects of Daily Life in Urban Areas. This Course Examines Governance From Legal, Political, Social, and Economic Perspectives. in Addition, The Module Provides In-Depth Discussions on How These Structures Constrain Collective Decision Making About Particular Urban Issues.

UPL 622 Location Theory

Location Theory Has Become an Integral Part of Urban Planning and Spatial Economics Disciplines. This Module Is Concerned with The Geographic Location of Economic Activity. It Addresses The Questions of What Economic Activities Are Located, Where and Why Within Both Cities and Regions with Specific Reference to Maximizing Revenues and Utilities.

UPL 623 Participatory Planning

This Course Is an Introduction to Nontraditional Approaches to Community Planning and Design. It Addresses to Basic Inquiries Of: What and Why Community Participation? It Focuses on Attempts to Raise The Awareness and Appreciation of The Need for Community Participation in Planning and Development. It Defines Community, Types and Interest Groups, Techniques of Building a Sense of Community, and Focuses on Concepts Associated with Community Participation, Involvement, Empowerment and Partnership. It Reviews The Evolution of The Concept Participation, Defines Its Scope, Principles and Process, Historical Precedent, Case Studies, Promoting Community Participation, and Addresses Futures for Present Community Planning and Design Issues.

UPL 624 Urban Planning in Third World Countries

This Course Provides a Comparative Examination of Planning Activities and Policies in Different Countries of The Third World. It Reviews Planning Practices and Trends in The

Third World- Developing Countries. It Focuses on Exploring Classification Methods, and Addresses The Differences Between The Developed and Developing Countries. It Provides an Analytical Historical and Cross-Cultural Approach to Explain and Evaluate Different Cities of The Third World.

UPL 625 Environment and Human Behavior

This Course Focuses on The Relationship Between Society, Culture, and The Individual in Everyday Life. It Is Designed to Provide Basic Tools to Investigate The Social Causes and Consequences of Human Behaviour The Course Provides a Better Understanding of Values, Opinions and The Issues That, and The Conceptual Tools Needed to Analyze The Sociological Dimensions of Environmental 'Problems'. Provide a Theoretical Basis for Understanding Social Dimensions of Environmental Issues. Develop a Theoretical Base Through an Exploration of Different Environmental Issues, Movements, Conflicts, Settings, Situations. Enable You to Examine Critically The Social Issues, and to Identify The Social Relationships.

UPL 626 Eco-Tourism

This Module Identifies The Types of Ecosystems That Would Increase The Opportunity for Realizing a Wider Diversity in The Tourism Experiences Offered Ranging From Soft Tourism in Beach Resorts to Alternative Tourism Such As Ecotourism and Adventure Tourism in The Desert Areas. This Diversity Is Recognized As an Important Principle for Achieving Sustainable Tourism Development. in This Context, This Module Identifies and Classifies The Different Tourism Attractions According to Tourist Typology. It Reviews The Principles for Sustainable Tourism and Assesses Relevant Cases of Best and Worst Practices in Order to Analyze The Theoretical and Methodological Approaches for Sustainable/ Eco Tourism Development.

UPL 627 Management of Heritage Sites

This Module Provides an Overview of Global Challenges and New Approaches in Conservation Planning for Cultural World Heritage Properties. It Examines Practical Problems in Conservation Planning. The Aim Is to Critically Understand, Assess, and Manage Risk to Cultural Heritage Sites, Specifically As It Relates to The Urban Planning Institutions and Agents.

UPL 628 Hillside Development

This Module Covers The Means By Which Successful Hillside Development Could Be Achieved. It Focuses on Technical Tools Through Which Potential Urban Design and Infrastructure Problems Are Minimised. The Module Also Draws The Attention Towards Public Safety and Urban Design Techniques Adopted in Hillside Developments Via National and International Case Studies.

UPL 629 Waterfront Development

This Module Looks At Strategies That Cities Should Employ to Capitalise on The Potential of Waterfronts and The Methods for Translating Strategies Into Reality Via Planning, Design, Construction and Management Techniques Based on Best Practice and Shared Experience, to Enhance The Quality of Life and Improve Their Urban Conditions. The Module Will Review a Range of International Waterfront Cities (Regenerated Waterfronts, New-Build Schemes) to Demonstrate The Benefits of Integrating Leisure, Retail, Residential and Commercial

Components Into Thriving Mixed-Use Waterfront Developments and Demonstrate The Considerable Social, Cultural and Economic Benefits of Such Integration. It Will Touch Upon The Positioning of Waterfronts in a Competitive Global Market, Public Private Partnerships, Civic Leadership for Gaining Political Support for Development and Urban Design Issues for Creating "Liveable Cities" Via a Spatial Development Strategy.

UPL 630 Marketing for Urban Development

This Course Provides an Overview of Marketing Tools, Essential for Any Urban Planner. Topics Discussed Will Include The Environment of Marketing- Marketing Planning, Comodfyinrg The Urban Environment- Place- Price and Marketing Communication Skills. Course Provides Hands on Experience to Promote New Communities.

UPL 631 New Urban Communities

This Module Charts The Development of Urban Communities Across Egypt Both Temporally and Geographically. It Examines The Patterns of Cleavage, Conflict, Convergence of Interest, and Consensus That Have Structured Urban Life. Social, Cultural, and Economic Forces Will Be Analyzed for The Roles They Have Played in Shaping The Diverse Communities of Egypt's New Urban Communities. Case Studies of Individual New Urban Communities Illustrate The Social, Political, and Environmental Consequences of Rapid Urban Expansion, As Well As The Ways in Which "Urban Problems" Have Been Understood Historically.

UPL 632 Strategic Environmental Assessment

This Course Offers an Introduction to The Concept of Strategic Environmental Assessment As a Contemporary Topic in Environmental Planning. It Provides a Definition of SEA, Its Scope and Methodology. It Discusses The Role of SEA in Shaping Future Policies and Analyzes The Implementation of SEA Worldwide.

UPL 633 Political Ecology

This Module Provides a Comprehensive Review of The Contemporary Debate on Development and Environmental Sustainability and Equips Participants with a Critical Understanding of Environmental Conflicts, and of Various Approaches to Environmental Governance, The Policy Process, The Mechanisms and The Key Agents Involved. It Examines The Politics and Discourses on Sustainable Development, Exploring Their Environmental Implications for The Countries of The North and South. It Also Focuses on The Critical Analysis of Socio-Environmental Conflicts, Their Roots and Potential Approaches to Their Resolution, with Specific Reference to The Third World.

UPL 634 Modeling and Simulation

This Course Offers Hands on Experience in Graphic Design Representation and Presentation Techniques. It Offers an Introduction to "Data Mining" and Computer-Based Applications in Remote Sensing, Mapping, Perspective Drawing, and Database Graphics. It Introduces Visual Urban Simulation Using Advanced Digital Applications, Such As GIS. Introduction to Terrain Engines, VRML, and Other Rendering Environments for The Display of Urban Planning Alternatives.

UPL 635 Green Communities

This Module Provides a Definition to The Green Communities, How They Can Be Achieved and What Are There Benefits. It Also Focuses on The Critical Understanding of Some Key

Terms Underpinning The Literature on Green Communities Such As Energy Conservation, Alternative Fuels, Alternative Energy Strategies and Green Building. Various National and International Case Studies Are Illustrated to Grasp The Core Ideas of The Module.

UPL 636 Environmental Risk Assessment

In This Course, Differentiates Between Environmental Hazards and Risks. It Addresses Different Types of Environmental Hazards, Such As Faults, Landslides and The Like, and Offers Risk Estimation and Evaluation. It Offers Alternative Risk Mitigation and Monitoring Measures. an Overview and an Analysis of Environmental Risk Assessment Case Studies Will Be Addressed.

UPL 637 Mechanisms of Environmental Management

This Module Provides a Comprehensive Review of The Contemporary Debate on Development and Environmental Sustainability and Equips Participants with a Critical Understanding of Environmental Conflicts, and of Various Approaches to Environmental Governance, The Policy Process, The Mechanisms and The Key Agents Involved. It Examines The Politics and Discourses on Sustainable Development, Exploring Their Environmental Implications for The Countries of The North and South. It Also Focuses on The Critical Analysis of Socio-Environmental Conflicts, Their Roots and Potential Approaches to Their Resolution, with Specific Reference to The Third World.

UPL 638 Environmental Impact Identification: Methods and Tools

This Course Provides an in Depth Analysis and Study of The Various Tools Used in Environmental Impact Identification E.G.: Ad Hoc, Checklists, Matrices, Networks, Quantitative Methods, and Overlay Maps, Tool Suitability. Students Develop Their Ability to Deal with These Techniques in Identification of Environmental Impacts.

UPL 639 Environmental Mapping and Planning

This Course Offers an Overview Into The Scope and Extent of Environmental Planning. It Addresses The Methodology of Environmental Mapping. It Highlights The Role of Environmental Planning in Shaping Planning Proposals and Urban Design Projects. It Addresses The Debate Arising From The Conflict That Arises From The Negative Impacts of Development on The Environment. Analysis of Case Studies Will Be Reviewed.

UPL 640 Environmental Auditing

This course deals with defining environmental, auditing and highlighting considerations of environmental auditing. Students are exposed to the tools used in environmental auditing e.g.: Checklist, Audit Finding Ranking Systems, and Compliance Software.

UPL 641 Social Dimension of EIA

A Growing Concern in The Field of Environmental Studies Has Been The Social and Cultural Dimension of EIA. This Course Addresses The Identification and Evaluation of Social Impacts. It Responds to What Is Meant By The Social Dimension of EIA and Defines The Framework of Social Impact Assessment Inside The EIA. It Addresses Social Concerns As Population Growth, Distribution and Mobility, Cultural and Traditional Impacts of The Implementation of Social Impact Assessment Worldwide.

7. Department of Electrical Power and Machines Engineering

EPM 511 Theories of Electrical Machines

The Basis Generalized Theory of Electrical Machines, The Basic Model of Electrical Machines, Linear Transformation, Kron's Primitive Machines, Writing Machine Models in Different Reference Frames.

EPM 512 Special Electrical Machines

Revision of Basic Concepts in Electromagnetism, Basics of Force and Torque Generation, Commutator Type Special Machines: Electrical Machine Amplifiers, Universal Motors, Repulsion Motors, Permanent Magnet DC Motors, Brushless DC Motors, Special Induction Motors, Linear Induction Motor, Two Phase Servomotors Systems, Special Synchronous Motors, Reluctance Motors, Switched Reluctance Machines, Hysteresis Motors, Stepper Motors, Inductor Type Generators, Super- Conducting Generators.

EPM 513 Transients in Electrical Machines

Storing Energy Electric Elements, Concept of Transient Phenomena, Derivation of Transient State Equations for Electrical Machines in The Original Frame of Reference, Derivation of State-Space Models, Solution Models Starting Performance in Induction Motors, Starting of Synchronous Motors, Starting of Reluctance Motors, Transients in Synchronous Generators Following Faults or Disturbances, Dynamic Performance Of DC Motors, Influence of Control Systems on Transients Performance.

EPM 514 Control of Electrical Machines

Types of Electric Drives, Transfer Functions of Separately-Excited DC Motors, Closed Loop Control Of DC Motors Applying Controlled Rectifiers and Choppers, Equivalent Circuits of Three- Phase Induction Motor, Speed Control of Three Phase Induction Motors, Voltage Control, Slip Energy Recovery, Inverter Methods, Direct Torque Control, Vector Control Methods, Synchronous Motors Equivalent Circuits, Vector Control Methods, Inverter Applications.

EPM 515 Electrical Machine Design (1)

Basic Equations, Magnetic Circuits, Stator Windings, Rotor Windings, Construction Details, Technologies of Machine Manufacturing Turbo Alternators, Salient Pole Machines, Induction Motors, Optimal Design, Computer Aided Design.

EPM 516 Fractional Horsepower Motors

Low Power DC Motors, Permanent Magnet DC Machines, Special Design Features of Low-Power DC Machines, Low Power Synchronous Motors, Three Phase Reluctance Motors, Switched Reluctance Motors, Single Phase Synchronous Motors, Low Power Induction Machines, Three Phase Motors, Universal Motors, Repulsion Motors.

EPM 521 Electrical Power System Analysis (Transient cases)

Transients in Synchronous Machines, Over-Voltages in Electrical Power Systems, Transient Stability in Electrical Power Systems, Multi-Machine System, Voltage Stability and Voltage Collapse in Power Systems.

EPM 522 Electrical Power Systems Planning

Characteristics of Electrical Loads, Load Forecast, Power Plant Allocation, Power Plant Sizing, Optimal Sizing and Sitting of Transformer and Switchgear Substations, Design of Power Transmission Lines, Design of Sub-transmission Lines, Design of Distribution Networks, Losses in Electrical Power Networks, The Reactive Power Equation, Voltage Regulation, Power System Reliability, Power System Protection.

EPM 523 Electrical Power System Control and Dynamics

Mathematical Models of Electric Power System Components, Stability Calculations, Automatic Voltage Regulators and Their Design Methods, Automatic Load Frequency Control Systems.

EPM 524 Management and Operation of Electric Power Systems

Unit Commitment Neglecting Transmission Loss, Unit Commitment Considering Transmission Losses, State Estimation, Security Considerations in Electric Power Systems.

EPM 525 Electrical Networks (1)

Load and Energy Forecast, Distribution System Planning, Design and Operation, Overhead Lines, Underground Cables, Earthing - Electric Capacitors, Power System Maintenance.

EPM 526 Protection of Electrical Power Systems

Principles of Electric Protection, Unit Protection, Electromechanical and Static Relays, Protection of Transmission Lines, Distance Relays, Protection of Power Transformers, Protection of Generators, Protection of Ring Distributors, Protection Organization and Application in Distribution Systems.

EPM 531 Switchgear Engineering in Electrical Power Systems

Dc and AC Electric Arcs, Applications, Circuit Breakers, Types and Applications, Transients in Electrical Power Systems, Insulation Coordination, Operation Under Steady State and Transient Conditions, Coordination of Insulation to Protect Against Over-Voltage.

EPM 532 High Voltage Engineering

High Voltage Testing, Impulse Voltages Tests, Impulse Switching, Breakdown Theories in Gases, High Impulse Calculations and Vibrations, Breakdown Theories in Solid Insulators, Test Samples Test Methods for Breakdown Voltage Measurement, Inter-Relation Between Measured Characteristics and Microscopic Formation of Insulating Materials, Performance of High Voltage Equipment in Different Conditions, Electric Cables, Current Carrying Capacity of Cables, Basic Insulator Level (BIL).

EPM 533 DC Transmission of Electrical Energy

Introduction to The Development Of DC Transmission Systems, Demonstration of Systems in Operation, Advantages and Disadvantages of DC Transmission of Electrical Energy Systems, Types of DC Transmission Lines, Types of Rectifier and Inverter Systems and Their Operation, Protective Systems DC Cables, Voltage Distribution and Insulation Stresses.

EPM 534 Electrical Equipment in Power Plants

Overview on Electrical Equipment in Power Plants, Generators and Exciters, Circuits Faults and Methods of Avoidance, Power Transformers, Methods of Earthing of Electric Power Equipment, Basics and Types of Circuit Breakers, Fuses and Relays, Protection of Generators and Transformers, Protection of Overhead Lines and Underground Cables of Electrical Energy Transmission, Protection Against Overloads, Protection of Symmetrical Networks, Distance Relaying, Bus-bar Systems Transmission System Testing, Fault Allocation, Control Rooms.

EPM 535 Computational Methods in Power System Analysis

Power System Matrices, Input and Transfer Matrices, Admittance Matrices of The Bus Bars, Impedance Matrices, Circuit Representation, Programming, Large System Simulation and Programming, Power Flow Studies Concepts and Methods, Approximate and Fast Methods, Separation Methods, Distribution Factors, Transfer Methods, Optimal Performance, Generation Control, Error Analysis, Simulation of Power System Components, Application of Some Computer Packages.

EPM 541 Energy Conversion by Semiconductor Devices

Energy Conversion Using Rectifiers, AC and DC Choppers, Inverters, Different Cases of Energy Conversion Using Static Devices

EPM 542 Power Electronics Systems

Revision of Thyristors, GTO and Power Transistors Characteristics, Protection and Rating Calculations, Single-Phase and Three-Phase Rectifiers, Methods of Improving Power Factor - DC Choppers for Static Loads - AC Choppers for Phase Control and Period Control in Single-Phase and Three Phase Systems, Different Types of Single-Phase and Three-Phase Inverters for Static Loads, Frequency Converters and Applications in Static Loads.

EPM 543 Electronic Devices for Electric Traction Systems

Application of Rectifiers in Electric Traction Systems, Application of Choppers in Electric Traction Systems, Frequency Converters Applications in AC Traction Systems, Advanced Braking Systems, Closed Loop Control in Electric Traction Systems.

EPM 544 Electric Traction Technologies

Introduction: Electric Traction Systems, Electric Trains, Motion Dynamics, Driving Devices, Speed-Time Curves, DC Traction Motors, Starting and Braking, Applications Of DC And AC Traction Motors, Feeders, Lighting Devices in Trains, Signaling, Case Study, Electric Trains on Town and Suburban Lines, Electric Train Way, Subway Trains, Electric Vehicles, Batteries and Recharging Equipment and Stations Electric Escalators and Elevators.

EPM 545 Electric Drives

Operation Characteristics of Electric Drives, Acceleration Time Curves for Electric Drive Systems, Modern Control Systems for Electric Drives, Modern Methods of Braking, Closed Loop Control Systems for Electric Drives.

EPM 546 Harmonic Analysis of Electric Traction Motors

Definitions and Introduction, Harmonic Sources, Standards and Limits, System Modeling for Harmonic Studies, Effects of Harmonics on System Components, Methods of Harmonics Suppression.

EPM 547 Control of DC Machines

Electric Control Circuits for Separately Excited DC Motor Using Rectifiers and Choppers, Control of DC Series Excited Motors; Electric Braking Using Modern Electronic Equipment, Closed Loop Control of DC Motors.

EPM 548 Control of AC Machines

Control of The Single-Phase Induction Motor Using AC Choppers, Control of 3-Phase Induction Motors Using Inverters, Control of Synchronous Motors Using Voltage Source Inverters, DC Brushless Motors, Closed Loop Control Systems.

EPM 549 Control of Electric Motors Using Logic Circuits

Control Systems Using Programmable Logic Circuits, Basic Functions, Advanced Functions, Case Studies: Robot Control, Control of Complex Systems Containing Electric Drives.

EPM 551 Digital Control of Electric Machines

Introduction, Digital Control in Excitation Systems in Synchronous Machines, Voltage Regulators, Power System Stabilizers, Digital Control of AC and DC Motors, Vector Control of AC Motors.

EPM 552 Digital Control of Electric Power Systems

Discrete Mathematical Models, The Z Transform, State-Space Representation, System Stability, Controller Design, Applications in Electric Power System.

EPM 553 Microprocessor Applications in Electric Power and Machines (1)

Main Concepts, Microprocessor Programming, Arithmetic Operations, Logic Operations, Control Commands, Subroutines, Microprocessor Interfacing and Methods, Digital Control in DC Motors.

EPM 554 Artificial Intelligence Applications in Electric Power Systems

Basic Concepts, Expert Systems, Artificial Neural Networks, Fuzzy Logic Controllers, Applications in Electric Power Systems.

EPM 555 Generation of Electric Energy from Renewable Resources (1)

Renewable Sources of Energy, Solar Energy, The Photo Voltaic Cells, Sizing of a Stand-Alone Photo Voltaic System, Control and Voltage Regulation, Storage Batteries and Inverters for Photo Voltaic Systems, Wind Energy, Generation of Electric Energy By Wind Turbines, Aerodynamic Characteristics of Wind Turbines, Wind Turbine Parameters, Basics of Control, Wind Data and Energy Estimation, Electric Power Generation.

EPM 571 Electrical Testing and Measurements (1)

Running a Group of Advanced Electrical Tests and Experiments in The Laboratories of The Electrical Power and Machines Department, These Are: Electrical Machines Lab, Power Systems Lab, High Voltage Lab, Computer Lab, Power Electronics Lab.

EPM 601 Electromagnetics

Electromagnetics and Electrical Engineering, Revision of Principles, Electric Fields, Polarization Work and Energy in Electric Fields, Lines of Force, Energy and Force, Static Magnetism Sources, Magnetic Circuits, Laplace Equation Magnetic Images, Energy and Force in Magnetic Fields, Time Varying Magnetic Fields, Maxwell's Equations, Electromagnetic Radiation, Electro-Magnetic Energy Conversion, Experimental and Numerical Methods, Digital Methods for Solution.

EPM 611 Theories of Electrical Machines

Basics of The General Theory of Electrical Machines, The Elementary Two Pole Machine, Kron's Primitive Machine, Linear Transformations, Power Invariance, Rotating Axes Frame of Reference, 3-Phase Reference Frame, Inter Frame Transformations, Torque Equations, Application and Limitations of The General Theory, Applications: DC Machines, Transient and Steady State Operation, Synchronous Machines, Transient and Steady State Operation, Induction Machines, Transient and Steady State Operation, Commutator Machines.

EPM 612 Transients in Linear Systems

Transient Performance in Linear Electric Circuits, Magnetically Coupled Circuits, Inertia Effects in Power Systems, Transients in Complex Systems, Magnetic Saturation Vector Control In AC Motors, Abnormal Modes of Operation in Synchronous Machines.

EPM 613 Design of Electrical Machines (2)

Windings of Single Phase and Three Phase Machines, Design, Computation of Magneto-motive Force and Winding Coefficients, Eddy Currents and Energy Losses in Machines and Transformers Winding, Design of High Starting Torque, Design of High Starting Torque in 3-Phase Induction Motors, Design of Single-Phase Induction Motors, Computation of Magnetizing and Leakage Inductances, Cooling and Ventilation of Electric Machines.

EPM 614 Control Systems of Electrical Machines

Control Of DC Motors By Single Phase and Three Phase Controlled Rectifiers, DC Choppers, Analysis Of AC Motors Controlled By AC Choppers, Inverters, Harmonic Analysis.

EPM 621 Electric Power System Analysis

Modeling of Electric Power System Components, Unsymmetrical Fault Analysis, Power Flow Computations, Reactive Power Compensators, Reactive Power Equalization Sizing and Sitting for Optimal Reactive Power Compensation.

EPM 622 Control of Electric Power Systems

Modeling of Main Components of Electrical Power System, Stability Analysis, Automatic Voltage Regulator Design, Expert Systems Speed Governors and Automatic Load Frequency Control Systems.

EPM 623 Operation of Electric Power Systems

Economic Considerations of Electric Loads Considering and Neglecting Constraints of Unit Commitment, Load Shedding, Generation Unit Characteristics, Security Considerations in Electric Power Systems.

EPM 624 Electric Networks (2)

Load and Energy Forecast, Electric Networks Planning in Transmission and Distribution of Electric Energy, DC Transmission Lines

EPM 625 Protection of Electrical Power Systems

Basic Concepts of Protective Relaying, Protection Systems, Potential and Current Transformers Protection of Transmission Lines, Distance Relays, Protection of Power Transformers, Protection of Generators, Digital Protection: Benefits and Advantages, System Components, Digital Protection Algorithms, Fourier and Walsh Transforms, Applications on Power System Protection, Application of Artificial Intelligence on Power System Protection.

EPM 631 High Voltage and Extra High Voltage Engineering

Electric Breakdown in Gases, Ionization of Gases, Deionization, Electric Discharge, Discharge Mechanisms, High Discharge, Breakdown in Alternating Fields, Electron Absorbing Gases, Breakdown in Insulating, Breakdown in Solid Insulators, Field Calculations and Control, Over Voltages and Protection Against Them, Traveling Waves and Applications, Electrical Insulators Coordination.

EPM 632 Electric Materials

Insulating Materials in DC and AC Conditions, Semi-Conductors, Conductors, Insulators Characteristics in Switchgear, Insulators Characteristics in Transformer and Switchgear Substations, Insulators in Other Pieces of Equipment

EPM 641 Power Electronics Systems

Static Switches, AC Voltage Controllers, DC Choppers, Inverters, Power Supplies, DC Electric Drives, AC Electric Drives, Firing Systems, Applications, Electric Furnaces, Static Power Equations, High Voltage DC Transmission, Electric Arc Welding, Ripple Control, Dimming of Lamps, Tap Changing in Power Transformers.

EPM 642 Design of Power Electronics Circuits

Switching Circuits Analysis, Thyristors and Power Transistors Characteristics, BJT IGBT, MOSFETS, Controlled Rectifier Design, AC Voltage Controller Design, Commutating Circuit Analysis, Chopper and Inverter Design Using Thyristors and Power Transistors, Filters Design, Inverters, Firing Circuits.

EPM 651 Generation of Electric Energy from Renewable Resources (2)

Types of Renewable Sources, Photo-Voltaic Cells, Operational Characteristics, Sizing of Independent System, Connecting a Photo-Voltaic System to a Power Network, Storage Batteries, Inverters, Wind Energy, Wind Dynamics and Wind Turbines, Data, Electric Energy Generation Equipment.

EPM 652 Microprocessor Applications in Electric Power and Machines (2)

Basic Concepts, Programming of a Microprocessor, Arithmetic Operations, Logic Operation, Control Commands, Stack Operation, Subroutines, Microprocessor Interfaces, Input / Output Processes, Applications in Electric Power Systems.

EPM 673 Electric Testing and Measurements (2)

A Group of Advanced Experiments in Electrical Machines Lab, Power Systems Lab, High Voltage Lab, Computer Lab, Power Electronics Lab

EPM 681 Selected Topics in Electric Power and Machines

Different Advanced Topics May Be Suggested At Different Semesters and Taught By Professors and Experts, Topics Belong to The Filed of Specialization in The Department of Electrical Power and Machines Engineering's.

EPM P98 Project (1)

EPM P99 Project (2)

8. Department of Electronics Engineering and Electrical Communications

ECE 500 Electrical Materials

Atomic Structure of The Material, The Crystal, Concepts of Quantum Mechanics, Energy Bands in Solids, The Electrons and Holes in Semiconductors, Impurities in Semiconductors, Conduction in Semiconductors, Recombination Mechanisms, Photo-Effects, Thermal Effects, Dielectric Materials and Devices Magnetic Properties of Materials.

ECE 501 Electronic Devices

The P-N Diode Theory, Static and Dynamic Models of The P-N Diode, The Bipolar Junction Transistor Models, The Safe Operating Area, Types, The MS Diode, The MIS Diode, The MOS Field Effect Transistor, Types, The Junction Field Effect Transistor JFET, Types, The MESFET's, Thyristors, Opto-Electronic Devices, Microwave Devices.

ECE 502 Advanced Semiconductors

General Properties (Bonds and Structure, Compound and Elemental), Energy Band Structure, Fermi and Imputity Levels, Degeneracy, Thermal Characteristics, Optical and Dielectric Characteristics, Mechanical Characteristics, Electrical Properties Carrier Density, Mobility and Diffusion Coefficient, Hall Coefficient, Recombination and Lifetime, Surface Properties, Ideal MIS System, Surface Depletion and Inversion, MIS Capacitor, Metal/Semiconductor Contacts.

ECE 503 Semiconductors Processing Technology

Crystal Growth and Wafer Preparation, Epitaxy, Diffusion, Ion Implantation, Oxidation, Lithography, Deposition, Metallization.

ECE 504 Semiconductor Measurements and Characterization

Crystal Orientation, Crystallographic Defects and Observation Methods, Resistivity and Carrier Concentration Measurement, Lifetime Measurement, Mobility Measurements, Thickness Measurement, Microscopy Based Methods, Analytical Methods (TEM, SEM, LEED, X Rays, Spectroscopy: Electron, Optical and Mass, Ion Backscattering, Radioactive Methods).

ECE 505 Materials for Photovoltaics

Semiconductor Materials for Photovoltaic Energy Conversion, Solar Silicon and Non Silicon Materials, Low Cost Material Technology, Solar Cells and Arrays, Photovoltaic System Design, Optical Elements (Covers and Coating), Electrical Elements (Interconnections and Blocking Diode), Mechanical Elements (Frames, Supports and Orientation Mechanisms), Environments and Testing.

ECE 506 Optical Processes in Semiconductors

Energy States in Semiconductors, Absorption and Absorption Spectrum, Radiative Transitions, Non-Radiative Recombination, Homo and Hetero-Junction, Stimulated Emission, Semiconductor Lasers, Luminescence, Photoelectric Emission, Polarization Effects, Photochemical Effects, Semiconductor/Electrolyte Photo-Electrochemical Cells.

ECE 507 Optical Fibers

Definitions and Terminology, Fiber Optic Cables, Fiber Optic Splices, Connectors and Couplers, Fiber Optic Test Methods.

ECE 508 Nano-Electronics Technology

Carrier Transport in 2D Semiconductor Structured Systems, Conduction in Superlattices, GaAs Based Heterostructures, Ternary and Quaternary Heterostructures, Sige/Si Quantum Structures.

ECE 509 Printed Circuits Materials and Design

Basic Considerations, Electrical Performance Considerations, Through Hole Mounting, Surface Mounting, Flexible Printed Circuits, Computer Aided Design, Design Verification and Post-Processing.

ECE 510 Integrated Circuits Engineering

The IC Processes, The NMOS, The CMOS and The Bipolar Process, Active Elements, Passive Elements, Layout of IC's, Building Blocks of Analog IC's, Building Blocks of Digital IC's, Analog Circuits, Digital Circuits and Systems.

ECE 511 Computer Aided Circuit Design (1)

Overview of PSPICE, How to Write a SPICE Netlist, Control Statements and Probe, SPICE Models, SPICE Internal Architecture and Building Blocks, Digital and Mixed-Mode Simulation, Behavioral Modeling and Simulation, Behavioral Neural Modeling Using VISSIM, IC Layout Design and Routing, Application, Specific Integrated Circuits (ASIC's), Examples.

ECE 512 Integrated Circuits Technology

Physics and Chemistry of Processing, The Integrated Circuit Processes The Bipolar, The NMOS and CMOS Processes, Physical Design of IC's, Thin Film Circuits, Thick Film Circuits, Assembly Techniques, Process Measurement and Testing of IC's, Quality of IC's

ECE 513 Thin and Thick Film Technology

Preparation of Thin Films: Vacuum Evaporation, Sputtering, Chemical Vapor Deposition, Substrates, Generation of Patterns, The Nature of Thin Films, Properties of Thin Films, Applications, Thick Film Processes, Inks, Thin Film Capacitors and Resistors, Mounting of Chips and Other Discrete Components.

ECE 514 Photovoltaic Systems (1)

Solar Radiation, Directions of Solar Beams at Horizontal Surface, Direction of Solar Beams on Fixed Filter Surface Facing, Tracking Systems, Solar Cell Characteristics, Solar Cell Design, Solar Cell Technology Photovoltaic Modules and Arrays, Energy Storage an Batteries, Design of Battery Voltage Regulators, Design of DC/DC Converters, DC/ACI Inverters, Design of Photovoltaic Systems.

ECE 515 Economics of Electronic Projects

Economic Analysis Techniques, Present Value, Playback Period, Return on Investment Demand, Production Theory, Efficiency of Operating a Plant, Production Cost and Pricing Policy in a Free Market.

ECE 520 Active Circuits (1)

RC-Active Circuits, Controlled Source Realizations, Analysis of Active Circuits, Operational Amplifiers and Linear Circuit Application, Network Decomposition, Structures, and Sensitivity, Filter Synthesis and Design, Switching Capacitor Filters, Wave Digital Filters.

ECE 521 Color TV Technology

Transmission Requirements, Color Mixing and Color Signals, Transmission Systems, Effect of Transmission Errors, Chrominance Signals, Coding and Decoding of Color Information Color Receivers, Special Circuits for Color TV.

ECE 522 Advanced TV Technology

Comb Filters, Separation of Chrominance and Luminance, Transcoders, Techniques for Bit Rate Reduction, Digital Coding, Digital TV Techniques.

ECE 523 Analog Artificial Neural Nets

Historical Review, Overviews of Neuro-Computing, Neural Network Concepts, Learning Laws, Basic Analog Building Block, Circuit Implementation of Neurons and Typical Nets, Typical System Examples.

ECE 524 Electronic Circuits for Automotive (1)

Introduction, Description of Components and Devices, Techniques for Analysis, Digital Circuits, Bipolar Transistor Logic, MOSFET Logic, Combinational Logic Circuits, Sequential Logic Circuits, Computer Analysis of Electronic Circuit.

ECE 525 Electronic Circuits for Automotive (2)

Analog Circuits, Small Signal Amplifiers, Large Signal Amplifiers, Feedback Amplifiers, Op Amp Circuits, Wave Form Generation and Conversion, Analog and Digital Conversion, Power Supplies, Controlled Rectifier Systems, Computer Analysis.

ECE 530 Advanced Electronic Measurements (1)

Measurement and Errors, Standards of Measurement, Bridge Measurements, Electronic Instruments for Measuring Basic Parameters, Oscilloscopes, Signal Generation, Signal Analysis, Frequency Counters, Transducers, Analog and Digital Acquisition Systems, Computer Controlled Test Systems, Fiber Optic Measurement.

ECE 531 Communication Electronics (1)

Analog Modulation Circuits, IC Oscillators, Function Generators, Active Filters, Switched Capacitor Filter PLL and Frequency Synthesizers, Pulse Modulation Circuits, Multiplexers, Introduction to Data Communication.

ECE 532 Industrial Electronics

Industrial Electronic Devices and Power Supplies, Sensors and Passive Electronic Transducers, Transducers, Actuators and Solid State Relays, Actuator, Sensor Interface, Industrial Timers, Industrial Control Systems, Speed Controllers, Industrial Data Acquisition Systems, Programmable Logic Controllers (PLC's), Automatic Test and Repair Equipment.

ECE 533 Biomedical Electronics (1)

Sensors and Transducers, Electrode, Instrumentation Amplifiers, Isolation Amplifiers, Analog Signal Processing IC's, Analog Switches and Multiplexers, Displays, Output Transducers.

ECE 534 Microprocessors and Interfacing Circuits (1)

PC/XT/AT Plug in Card and Chip Interfacing Input/Output Memory, Input-Output Ports, Devices and Components, Bus Controllers Interfacing Standards, Interfacing Programming.

ECE 540 Information Theory and Coding

Information Measure, Discrete Memoryless Source, Entropy Function, Maximality of Entropy Function, Markov Sources, Channel Capacity, Continuous Channels, Shannon's Theory, Source Coding, Efficiency in Coding, Optimum Coding, Error Detection and Correction Codes: Block Codes, Cyclic Codes, Sequential Codes.

ECE 541 Digital Signal Processing Applications (1)

Discrete Fourier Transform, FFT Z Transform, Digital Filter, Adaptive Filters, Application of Adaptive Filter, 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 550 Satellite Communication Systems

Satellite System Configuration and Link Calculations, Orbiting Satellites, Signal Processing and Multiplexing in Terrestrial Interface Subsystems, Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access, Digital Satellite Earth Stations, on Board Processing.

ECE 551 Digital Communication Systems (1)

Sampling and Pulse Modulation, Pulse Transmission, Digital Signals and Systems, Noise and Errors, Inter-Symbol Interference, Regenerative Repeaters, Matched Filtering, Synchronization Techniques, Pulse Code Modulation, Band-Pass Digital Transmission, Coherent Binary Systems, Non-Coherent Binary Systems.

ECE 552 Mobile Communication Systems

Introduction, Effect of Mobiling 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 Non-Fade 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 553 Advanced Electronic Communication Systems

Digital Signals and Systems, Base Band Digital Communication Systems, Modulated Digital Signals, Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access, Satellite Communication Systems, Mobile Communication Systems, Data Communications.

ECE 555 Microwave Communication Systems

Study of Digital Modulation Techniques Used in Microwaves, Microwave Amplifiers, Measurement of Microwave Networks, Design of Microwaves Networks, Frequency Plan of Microwave Networks

ECE 560 Data Communication

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, Inter-Networking, Integrated Services Digital Network.

ECE 561 Transmission Systems

Line Transmission, Audio Frequency Systems, Carrier Systems for Pair, Type Lines, Coaxial Cable Carrier Systems, Line System Reliability, Submarine Cable Systems, Pulse Code Modulation Systems, Radio Systems, Satellite Communication Systems.

ECE 562 Mathematical Models in Networks

Unit of Telephone Traffic, Types of Switching Systems from a Traffic Aspect, Lost Call Systems, Queuing Systems, Input Process, Queue Behavior, Service Mechanism, Overflow Systems, Methods of Studying, Tele-Traffic Problems, Analytical Models, Simulation Techniques, Traffic Measurement.

ECE 563 Network Planning

Stages in Planning, Present Network Knowledge, Traffic Forecasts, Plant Details, Network Standards, Numbering Plan, Charging Plan, Routing Plan, Signaling Standards, Grade of Service, Local Network Planning, Growth Planning.

ECE 564 Local Area Networks

Introduction to Local Area Networks, Access Protocols IEEE 802 Standard, Data Link Layer, Carrier Sense Multiple Access/Collision Detection Protocol, Token Ring, Token Bus, Fiber Distributed Data Interface, Metropolitan Area Network.

ECE 570 Antennas Theory and Measurements

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 Array, 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, Receiving Antennas:

Reciprocity Theorem and Effective Area for Antennas, Antenna Noise Temperature, Propagation: Surface Wave Propagation, Ionosheric Propagation, Microwave and Millimeter Wave Propagation, Introduction to Microstrip Antenna.

ECE 571 Microwave Electronics

Microwave Semiconductor Devices, Two Terminal Microwave Devices and Their Use in Detection, Mixing Change of Phase and Displacement, Negative Resistance Microwave Devices and Their Use in Amplifiers, (FET) Transistor FET in Microwave Amplifiers.

ECE 572 Planar Microwave Circuits

Analysis of Planar Microwave Circuits, Use of Planar Circuits in The Design of Passive Devices Such as Filters, Transformers and Have Distributions, Use of Planar Circuits in Design of Active Devices Such as Detectors, Mixers Voltage and Power Amplifiers.

ECE 574 Modeling Techniques for Microwave Engineering

Modeling Techniques for Electromagnetic Waves Using Computers, Time Domain, Frequency Domain, Quasistatic Equations, Harmonic Equilibrium, Use of Ready Made Computer Programs in Modeling of Electromagnetic Waves.

ECE 575 Microwaves Circuits

Transformers, Resonators, Power Dividers Hybrid Junctions, Directional Couplers, Scattering from Obstacles, Filters, Theory of Magnetic Materials, Ferrite Devices.

ECE 580 Opto-Electronic Engineering (1)

Basic Semiconductor Optical Properties, Hetero-Junctions, Injection Luminescence, Design of LED for Optical Communication, Principles of Laser Action, The Fabry, Perot Cavity, Laser Line Width, Generation of Pulses, Theory of Semiconductor Laser, Modulation Frequency Response of LD, Noise in LD, Stripe Geometry of LD, Gain and Index Guidance in LD, Quantum Well Lasers.

ECE 581 Integrated Optics (1)

Analysis of Open Wave-Guides, Symmetric Slab Wave-Guide, Multi Layer Wave-Guide Graded Index Wave-Guide, The WKB Method, Two Dimensional Wave-Guide, The Effective Index Method (EIM), Integrated Optical Components, Beam Propagation Method, Fabrication Technique, Characterization Techniques, Integrated Opto-Electronics.

ECE 582 Optical Measurements

Basic Concepts for The Measurement of Fast Processes: Streatc Techniques, Sampling Technique, Measurement of This Intervals as Spatial Displacement, Signal Conversion Correlation Methods, Limits for Time Resolution, Non Linear Optical Methods for Measuring Ultra-short Light Pulses, Measurement of The Intensity Correlation Function By Means of Second Harmonic Generation, and Two Photon Florescence, Measurement of Intensity Cross Correlation Functions, Optical Kerr Gates, Fluorescence Measurement Ultra-fast Spectroscopy, High Resolution Nonlinear Optical Spectroscopy Four Wave Mixing Spectroscopy, Multi-photon Spectroscopy, Optical Fiber Measurements, LD Measurements.

ECE 583 Quantum Electronics (1)

Need for Quantum Theory, Schrodinger Formulation, Examples, Quantum Well, Approximate Methods Transition Rates, Dirac Formulation.

ECE 584 Nonlinear Optical Engineering (1)

Nonlinear Optical Susceptibilities, Wave Propagation in Nonlinear Media, Electro/Optic and Magneto Optic Effects, Optical Rectification, Sum Frequency Generation, Difference Frequency Generation, Parametric Amplification and Oscillation, Kerr Effect and Self Phase Modulation, Solution Propagation, Solution on Fibers, Cross Phase Modulation, All Optical Switching and Logic Operations, Optical Pulse Compression, Optical Amplification, Erbium Doped Fibers, Raman Amplification

ECE 590 Optical Wave Guide Engineering (1)

Asymmetric Slab Wave-Guide، Step Index Optical Fibers Rays in Graded Index Wave-Guides, W.K.B Method and Wave Treatment of Slab and Optical Fibers, Dispersion in Fibers and Fiber Bandwidth, Attenuator in Fibers, Fiber Intensity and Interferometric Sensors.

ECE 591 Optics Engineering (1)

Diffraction Theory, Huygen's Principle, Diffraction Integral, Gaussian Beam Propagation, Wave Optics of Thin Lenses, Fourier Optics, Holography, Optical Fibers: Step Index and Graded Index.

ECE 592 Optical Communication Systems (1)

Overview of Optical Communications, Optical Fiber Power Launching and Coupling, Optical Receiver Operation, Photo Detectors and Preamplifiers, Point to Point Optical Links, Carrier to Noise Ratio, Optical Atmospheric Links, Progress in Optical Communications.

ECE 600 Electronic Materials

Crystals and Crystallo-Graphic Imperfections, Electron Motion in Atoms and Crystals, The Energy Band Structure, The Lattice Vibrations, Classical and Quantum Statistics, Statistics of Electrons and Holes, Scattering Theory, Boltzmann, Transport Equation, Generation Recombination, The Thermiomic Emission, Dielectric Materials, Magnetic Materials, Thermal Effects, Optical Effects, Hetero-junction.

ECE 601 Modeling and Simulation of Electronic Devices

The Detailed Theory of P-N Diode, The Static and Dynamic Models of The P-N Diode, Model Parameters Extraction, The Vertical and Horizontal Transistors: The Early Effect, The Kirk Effect, Factors Limiting The Current Gain, The Transit Time, Factors Limiting, The Advanced Static and Dynamic Transistor Models, Polysilicon Emitter, Scaling, The Hetro-junction Transistors, The Transistor Noise, The Advanced Bipolar Devices.

ECE 602 Advanced Field Effect Transistors

Review, MS Contacts, JFET and MESFET, MIS Diode and CCD, MOSFET, Nonvolatile Memory Devices, The Sub-Micro MOSFET, Hetro-structure Field Effect Transistors, Hot Electron Transistors, Novel FET Devices, Applications

ECE 603 Thin Film Technology

Crystal and chemical properties of solid surfaces, surface diffusion, deposition and epitaxial crystal growth, vacuum technology, measurement of the properties of solid surfaces, crystal growth and surface layer treatment techniques, thin film properties and their measurement, structural electrical and optical properties of thin solid films.

ECE 605 Power Devices and Applications

The High Injection Effects in a P-N Diode, The Breakdown Phenomena, The PIN Diode, The Power Transistor, The Silicon Controlled Rectifier SCR, The AC Triode TRIAC, The AC Diode DIAC, The Gate Turn Off Thyristor GTO, The Static Analog Transistor, The Vertical MOS Transistor, Hybrid Devices, New Power Devices, Smart Power IC's, Applications in Power Conditioning Circuits.

ECE 607 Advanced Photovoltaic Systems

Solar Systems, Tracking Systems, High Efficiency Solar Cells, Economical Solar Cells, Design of Cell Structures, Cells Fabrication, Components of Photovoltaic Systems, Design of Photovoltaic Systems Using Computers, Different Applications of Photovoltaic Systems, Space Applications.

ECE 611 Design of Analog IC's

Review of Circuit Simulation, Current Sources and Sinks, Current Mirrors, Voltage and Current References, Inverting Amplifiers, Differential Amplifiers, Output Amplifiers, Operational Amplifiers, Compactors D/A Converters A/D Converters, Analog Signal Processing Circuits, Filters.

ECE 612 Design of Digital IC's

Review of Circuit Simulation, Design Abstraction Characteristics of Digital Circuits, Bipolar Logic Gates, MOS Logic Gates, Signal Propagation Delays, Power, Noise in Digital Logic Circuits, Programmable Logic Arrays, Semiconductor Memories, Finite State Machines, Micro-Coded Controls, Microprocessor Design, Systolic Arrays.

ECE 613 VLSI Design

Layout Design of Analog and Digital IC's, The Evolution of VLSI, Design System Concepts, IC Design Approaches, Logic Entry and Verification Tools, Graphics Language for Physical Design, Physical Design Tools, Library Development, Test Methodologies, Applications from The Designers Handbook of IC's, and IC Data Books, Other Specialized Books for The Relevant Application.

ECE 614 VLSI Technology

Crystal Growth and Wafer Preparation, Epitaxy, Oxidation, Lithogrogly, Plasma Etching, The CVD, Deposition, Ion Implementation, Metallization, Process Simulation, VLSI Process Integration, Analytical Techniques, Assembly Techniques, Yield and Reliability.

ECE 615 Design of Analog Integrated systems

Filter Design, Analog to Digital and Digital to Analog Converters.

ECE 617 Computer Aided Circuit Design (2)

Techniques of Solving Electrical and Electronic Circuits Using Computer, DC and AC Solution of Linear and Nonlinear Circuits, Dynamic Properties of Circuits, Electrical and Electronic Components, Determination of Models Variables, Circuit Simulation Packages, Circuit Design, Logical Analysis.

ECE 620 Active Circuits (2)

Element and Sub-Networks of RC-Active Networks, Controlled-Source Realizations, Negative Immittance Converter Realizations, Gyrator Realizations, Infinite Gain Realizations, Mutators, Scattering Parameters Technique. Analysis of Active Networks Using Nullors, Operational Amplifier and Linear Circuit Applications, Networks Decomposition, Structures, and Sensitivity, Biquandratic Filter Synthesis and Design, Ladder Filter Synthesis Using Immittance Simulation, Switching Capacitor Filter Using Voltage Inverter Switches, Capacitor/Commulator Networks, Wave Digital Filters.

ECE 621 Advanced Electronic Circuits

General Theory of Comb Filters, Methods of Chrominance and Luminance Separation for Transcoders, Transcoding Techniques, Techniques for Bit Rate Reduction of Digital Video Signals, Reduction of Sampling Frequency, Digital Coding of PAL and SECAN Video Signals, Digital TV Techniques.

ECE 622 Color TV Systems and Technology

Color TV Transmission Requirements, Color Mixing and Color Theory, Color TV Signals, Color TV Transmission Systems, Effect of Transmission Errors on Color Signals, Chrominance Signals, Coding and Decoding of Color Information, Color TV Receivers, Vertical and Horizontal Deflection Circuits, High Voltage Generation.

ECE 623 Microprocessor and Interfacing Circuits (2)

PC/XT/AT Plug in Card and Chip Interfacing, Input, Output Memory, I/O Ports, Bus Controllers, Interfacing Standard and Custom Peripherals, Interfacing Software Techniques.

ECE 631 Communication Electronics (2)

Analog Modulation Circuits, IC Oscillators, Function Generators, Crystal Oscillators, Voltage Controlled Oscillators, Switched Capacitor Filters, PLL and Frequency Synthesizers, TV IC's, Pulse Modulation Circuits, Signal Conversion Circuits, Multipluxers, Telephone Circuit, Computer Communication Interface Circuits, DSP IC's.

ECE 632 Selected Topics in Electronic Engineering

Advanced Selected Topics in Electrical and Electronic Engineering, Electronic Integrated Circuits, Modern and Quantum Electronic Device.

ECE 633 Biomedical Electronics (2)

Sensors and Transducers, Electrochemical Electrodes, Instrumentation and Isolation Amplifiers, Analog Signal Processing, Multiplexing, Signal Converters, Interfacing, Controllers, DSP, Displays Output Transducers.

ECE 641 Digital Signal Processing Applications (2)

Digital Filters, Adaptive Digital Filters, Echo Cancellers and Suppressors, Speech Signal Processing, Speech Coders, Speaker and Speech Recognition Mitten Markov Models, Artificial Neural Networks, Image Processing for Data Compression, Optical Character Recognition.

ECE 650 Digital Communication Systems (2)

Digital Signals and Systems, Noise and Error, Intersymbol Interference, Performance Analysis of Basic Digital Modulation Schemes on Power and Bound-Width Equivalent Basis, Multi Continuous Phase Modulation, Synchronization Considerations for Multi Continuous Phase Modulation, Satellite Communications, Spread Spectrum Systems.

ECE 651 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 653 Satellite Communications Technology

Terminology of Satellite Communications, Geo-stationary Satellite Communications, Allocation of Frequencies and Their Efficient Utilization, Efficient Utilization of Satellite Orbit, Multiple Access, Commercial Satellite Communications, Life of Satellites, Launch of Communication Satellites, Tracking and Control of Communication Satellites, Problems in Radio Wave Propagation, Antennas, FM Transmission Systems, Digital Satellite Communications Systems, Earth Station Technologies, Maritime Satellite Communications.

ECE 659 Selected Topics in Microwave Engineering

Advanced Selected Topics in Microwave Communication Systems, Microwave Circuits, Microwave Electronics and Antennas.

ECE 660 Data Networks

Data Transmission, Data Encoding, Digital Data Communication Techniques, Data Link Control Multiplexing, Communication Networking Techniques Circuit Switching, Packet Switching, Radio and Satellite Networks, Local Networks, Computer Communications Architecture, Network Access Protocols, Inter-Networking, Transport Protocols, Session Services and Protocols, Presentation, Application Protocols, Integrated Services Digital Network.

ECE 670 Mobile Antennas

Fixed Site Antennas, The Radio Communication Channel, Communications Using Earth Orbiting Satellites, Radio Test Sites, Radio Wave Propagation Practice, Waves in Multi-Path Propagation, Measuring Receiver Sensitivity, General View of Antennas Systems for Mobile Communications, Essential Techniques in Mobile Antenna Systems Design, Landmobile Antenna Systems, Basic Techniques and Applications, Antenna for Mobile Satellite Systems, Antenna Systems for Aironautical Mobile Communications.

ECE 671 Advanced Microwave Electronics

Physical Principle and Design Considerations of Two Terminal Microwave Semiconductor Devices, Negative Resistance Devices, Transistors and Applications in Microwave Circuits "Amplifiers, Oscillators and Mixers".

ECE 672 Active Microwave Circuits

Analysis and Design of Microwave Amplifiers and Oscillators Using Semiconductor Devices, Stability Study and Noise Effects.

ECE 673 Electromagnetic Waves

Fundamentals of Electromagnetic Waves, Green's Function Characteristics, Applications of Green's Function, Green's Function for Stratified Medium, Transverse Electromagnetic Waves, Transmission Lines, Wave-Guides and Cavity Resonators, Irregular Wave-Guides and Dielectric Resonate Circuit, Excitation of Wave-Guide Cavities, Periodic Structures, Plane Waves.

ECE 674 Microwave Semiconductor Devices

Semiconductor Devices and Transistors Used in The Millimeter Wave and Microwave Frequencies.

ECE 675 Advanced Passive Microwave Circuits

Planar Transmission Lines, Microwave Transformers, Power Dividers, Hybrid Junctions, Directional Couplers, Scattering From Obstacles, Resonators, Filters, Non-Reciprocal Devices.

ECE 676 Terrestrial Microwave Communication Systems

Link Planning, Standard Specifications for Equipments and Antenna Performance, Microwave Propagation, Frequency Planning and Link Budget Calculations

ECE 677 Analysis and Modeling Techniques for Electromagnetic Waves

Modeling Techniques for Electromagnetic Waves Using Computers "Time Domain, Frequency Domain and Quasi-Static Equations", Use of Available Computer Simulators for Modeling of Transmission Lines, Resonators, Passive and Active Microwave Circuits and Antennas.

ECE 678 Antenna Theory and Design

Antenna Types, Design of Rectangular and Circular Apertures Antennas, Antenna Arrays, Mutual Coupling, Reflector-Type Antennas, Design of Feeding Networks, Antennas for Satellite Applications.

ECE 680 Opto-Electronic Engineering (2)

Semiconductor Hetero-Junctions, Injection Luminescence, The Fabry Peroit Cavity, Theory of Semiconductor Lasers, Gain/Current Relation, Light/Current Relation, Optical Modes, Control of Modes, Stripe Geometry Lasers, DFB Laser, Dynamic Response of Lasers, Photon/Electron Resonance, Rate Equations, Laser Bandwidth, LD Line-Width, Noise Fluctuation in LD, Physics of QW Lasers, Dynamics of QWL, MQW Laser Characteristic.

ECE 681 Integrated Optics (2)

Guided and Radiation Modes in Open Wave-Guides, Asymmetric Slap Guide, Rectangular Dielectric Wave Guide, Modal Expansion, Leaky Waves, The WKB Method, The Effective Index Techniques, Coupled Mode Theory, Theory of Directional Coupler, Multi-Mode Interference Devices, Branching Devices, Generalized Beam Propagation Method, Fabrication Techniques, Characterization Techniques.

ECE 683 Quantum Electronics (2)

Basic Formulation for Quantum Theory, Simple Harmonic Oscillator, Quantum Well, Approximate Methods, Examples, Transition Rates, Quantum Statistics, Practical Applications.

ECE 684 Nonlinear Optical Engineering (2)

Nonlinear Optical Susceptibilities, Wave Propagation in Nonlinear Media, Electroptic and Magnetoptic Effect, Optical Rectification, Sum Frequency Generation, Difference Frequency Generation, Parametric Amplification and Oscillation, Four Wave Mixing, Stimulated Raman Scattering, Stimulated Brillouin Scattering and Phase Conjugation, Optical Amplification on Fibers, Fiber Lasers, Kerr Effect and Self Phase Modulation, Solution Propagation, Higher Order Solutions and Pulse Compression, Cross Phase Modulation, All Optical Switching and Logic Operations, Two Photon Absorption, High Resolution Nonlinear Optical Spectroscopy, Self Focusing, Multi-Photon Spectroscopy, Nonlinear Optical Effects in Plasmas.

ECE 685 Integrated Optics Technology

Step Index and Graded Index Open Wave-guide, Two Dimensional Wave-Guide, Integrated Optical Components, The Effective Index Method (EIM), Ionic Exchange Diffused Wave-Guides, The Inverse WKB Method, Wave-Guide on Semiconductor Substrates, Epitaxial Growth, Standard Integrated Circuit Technology, Opto-Electronic Integration, Quantum Well Opto-Electronics, Characterization Techniques.

ECE 686 Theoretical Basics of Optical Waves

Eigen Value and Eigen Vectors of Matrices, Calculus of Matrices, System Dynamics, Periodic Wave-Guides, Linear Vector Spaces, Projection Theorem, Linear Operators, Inversion of Operators, Testing and Symbolic Functions, The Differential Operators, Domain, Adjoint and Inverse, Two Dimensional Green's Function, Excitation of Wave Guides, Eigenvalue Problem, Theory of Eigen Function Representation, Green's Functions and Spectral Representation, Continuous Spectrum, Perturbation of The Spectrum

ECE 689 Selected Topics in Opto-Electronics

Advanced Selected Topics in Opto-Electronics.

ECE 690 Optical Wave-Guide Engineering (2)

General Characteristic of Slab Wave-Guide, Asymmetric Slab Wave-Guide, Rectangular Dielectric Wave-Guide, The Effective Index Method, Bent Slab Wave-Guide, DFB Slab Wave-Guide, The W.K.B Method, Graded Index Wave-Guides, Single Mode SI Fiber, Bent SI Optical Fiber, Erbium Doped Fiber Amplifier, LD Fiber Coupling، Excitation of Slab Wave-Guide.

ECE 691 Optics Engineering (2)

Diffraction Theory, Huygen's Principle, Diffraction Integral, Gaussian Beam Propagation, Wave Optics of Thin Lenses, Fourier Optics and Spatial Filtering, Geometrical Optics, Lenses and Aberrations, Geometrical Theory of Optical Imaging Systems, Holography, Guided Wave Propagation, Optical Fibers: Step Index and Graded Index, Approximate Methods for Graded Index Media: Perturbation, Variational and WKB Techniques, Wave Propagation in Square Law Media.

ECE 692 Optical Communication Systems (2)

Basic Building Blocks, Engineering Considerations for System Design, Digital and Analog Optical Systems, Coherent Optical Systems, Solution Propagation and Advanced Systems and Techniques.

ECE 693 Simulation Techniques in Optical Communication

Semiconductor Laser Rate Equations, Self Consistent Device Simulation, Integrated Optical Circuits, The Effective Index Method, The WKB Method, Mode Matching Techniques, The Beam Propagation Method (BPM), Finite Difference BPM, Computer Aided Design CAD of Optical Communication Systems, Computer Aided Design CAD of Optical Integrated Circuits.

ECE 695 Theoretical Basis of Optical Engineering (2)

General Theory of Eigenvalues and Eigen Functions, The Minimum Problem, Variational Properties, Rayliegh Ritz Method, Three Dimension Green's Function, The Neoman and Robin Functions, Excitation of Slab and Rectangular Wave-Guides, Cylindrical Eigen Functions, The Hankel and Weber Formulas, Excitation of Cylindrical Wave-Guides, Spherical Eigen Function, Legendre Functions, Diffraction's, Diffraction By a Sphere, Source Function for Wave Propagation.

ECE P97 Project

ECE P98 Project (1)

ECE P99 Project (2)

9. Department of Computer Engineering and Systems

CSE 501 Systems Engineering

Evaluation of Systems Science and Its Historical Development, Systems Movement and Its Relation to Cybernetics, Operations Research, Systems Analysis and Systems Engineering, Systems Modeling: Classical Deterministic Models, The Standard Linear Programming Model, Inventory Models, Queuing Models, Systems Methodology, Adaptive Systems, Applications: Computer-Board Systems, Industrial Systems, Economic and Social Economic Systems.

CSE 502 Control Systems (1)

Control Strategies, Transfer Functions and Transfer Operators, Transport Delays, State Models, System Time Response, Model Estimation from Time Response, Frequency Domain Response, Closed Loop Stability, Frequency Domain Compensatory Design, Industrial Controllers and Final Control Elements, Experimental Testing of Plant, Control System Performance and Commissioning.

CSE 504 Industrial Process Dynamics

Introduction, Lumped Parameter Systems, Distributed Parameter Systems, Linearization, Transient and Steady State Responses, Dynamic Models, Structure of Dynamic Models, Dynamic System Characteristics, Mechanical Systems, Electromechanical Systems, Thermal Systems, Hydraulic Systems, Pneumatic Systems, Numerical Solutions, Analog and Digital Simulation.

CSE 505 Measurement Systems

Information and Signal Processing, Type of Measurements and Instrumentation Specification, Intelligent Instrumentation, Temperature Measurements, Torque Measurements, Pressure Measurements, Selected Other Measurements: Humidity, Acidity, Density, Sound, Level, Motion, Chemical Analysis, Digital Transducers, Instrument Technology: Design and Construction of Instruments, Instrument Installation, Display and Recording, Reliability, Safety, Design and Construction, Redundant Measurement and Their Role in Fault Detection.

CSE 510 Selected Topics in Control and Systems Engineering

This Course Will Be Offered Whenever Required to Teach Subjects on Robust Control, Inferential Control and Identification Self Tuning and Adaptive Control, in General Recent Developments in Theory and Applications in Control Engineering Will Be Considered.

CSE 511 Signal Processing

Types of Signals, Discrete Fourier Transforms DFT, Fast Fourier Transforms FFT, Inverse Transform, Storage Requirements, Random Number's, Spectral Analysis and Coherence Estimation, Frequency and Time Domain Response of Linear Systems, Software Development, Digital Filtering Fundamentals of Infinite Impulse Response IIR and Finite Impulse Design of IIR and FIR Filters, Decimation and Interpolation Routines Development of Simple Routines Throughout The Course Material That Are Portable and Easy to Use.

CSE 512 Control Systems (2)

Introduction, Digital Control Concepts (Sampling, Holders, Signal Conditioning and Data Acquisition Systems), Digital Control Strategies, Tracking Control, Self Tuning Control, Adaptive Control, Noise Rejection in Control Systems, Software Engineering in Digital Control, Real Time Operation Systems for Digital Control, Supervisory Control, Monitoring and Man-Machine Interface, Programmable Logic Controllers.

CSE 514 Computer Applications in Control

Computer Control Principles, Digital Proportional, Derivative, Integral Control, Pole-Placement Digital Control, Independent Regulation and Tracking Pole-Placement Control, Minimum Variance Controller, Generalized Minimum Variance Control, Computer Process Identification Using Least Squares Method, Practical Tips of Industrial Process Identification, Using Matlab for Control Algorithms Simulation.

CSE 515 Computer Controlled Systems

Introduction to Computer Control Technology, Computer Oriented Mathematical Models, Process Oriented Models, Disturbance Model: Reduction of Disturbance, Stochastic Models, Top-Down and Bottom Up Design Approach, Profiteering and Computational Delay, Realization of Digital Controllers.

CSE 520 Digital Control

Introduction to Digital Control, Sampling Theorem and Z-Transform, Time and Frequency Domain Analysis of Discrete Time System, Controllability and Observability, Design of Digital Controllers, Microprocessor Implementation of Digital Filters, Case Studies, State Space Analysis and Time Domain Analysis of Control Systems, Liapunov Stability Analysis, Treatment of Time Delayed Systems.

CSE 521 Industrial Process Control

Introduction, Typical Industrial Controllers, On-Off Controllers, Three Mode Controllers, Interacting and Non Interacting Controllers, Pumpless Controllers, Model Based Controllers, Parameter Tuning, Cascade Controllers, Feed Forward Controllers, Multivariable Controllers, Adaptive Controllers.

CSE 522 Distributed Control Systems

Introduction and Overview, System Architecture, DATA Communication Links, Distributed Control Modules, DCS Hardware, DCS Software, Processor Modules, Field Bus Modules, Ladder Logic Control, Reliability and Security, Batch and Continuous Control, System Monitoring and Management Function, Algorithms, Applications.

CSE 523 Robot Systems

Introduction to Robot Technology, Geometrical Modeling of Industrial Robot Arms, Homogeneous Transformation Matrix, Direct Kinematics Modeling of Industrial Robot Arms, Inverse Kinematics Modeling of Industrial Robot Arms.

CSE 524 Systems Modeling and Simulation

Basic Methodologies in Solving Problems with Simulation for Continuous and Discrete Systems, Concepts in Continuous Systems Simulation, Features and Classifications of Digital

Simulation Languages, Software Structure, Tools for The Simulation of Systems with Predominantly Continuous Characteristics, Influence of Software Engineering and Modern Technology on Simulation, Case Studies.

CSE 525 Real-Time Industrial Systems

Computers in Industry, Design of Real Time Systems, Interfaces to External Signals and Devices, Serial Communications, Board-Based Micro Computer Systems, Introduction to Programmable Logic Controllers, Programming Using Ladder Diagram, Programming Languages, PLC Hardware, Timers and Counters, Arithmetic Functions, Advanced Programming Techniques.

CSE 526 Microprocessor Industrial Applications

Microprocessor as Components in Engineering Systems, Information and Power, DC Motor Control and Testing, Position Control with a Stepping Motor, Temperature Control, Control of a Blending Process, Automatic Weighing, A Polar Plotter, Automatic Cutting Machine.

CSE 527 Advanced Control Systems

Introduction, Nonlinear Control, Nonlinear Servo-Mechanism Theory, Feedback Linearization, Optimal Control, Robust Control, Eigen-Structure Assignment, H Optimization Techniques, Integration of Robust Control, Quantitative Feedback Theory, Introduction to Intelligent Control, Hybrid Control, Applications.

CSE 528 PC-Based Laboratory Automation

Introduction, Data Collection and Instrument Control, Digital to Analog Converters, Analog to Digital Converters, Noise Detection and Reduction Techniques, Digital Input Output, IEEE-488 (GPIB), Programming GPIB, Serial Communication, Timers and Counters, Data Analysis, Peak Detection, Digital Signal Processing, Local Area Networks, Languages for High Speed, Interrupts and Direct Memory Access (DMA).

CSE 530 Software Engineering

Introduction: Well Engineered Software, The Software Process, Management Process Models, Human Factors in Software Engineering, Knowledge Processing, Group Working, Software Specification: Software Requirements Definition, System Modeling, Requirements Specification, Software Prototyping, Formal Specification, Algebraic Specification, Model-Based Specification, Software Design: The Design Process, Design Strategies, Design Quality, Object Oriented Design: Function Oriented Design Case Tools, User Interface, Validation and Verification.

CSE 531 Introduction to Artificial Intelligence

AI Definitions, AI Applications, Knowledge Importance, Knowledge-Based Systems, Knowledge Representation, Search Problems, Blind Search, Informed Search, Structured Knowledge, Associative Network, Object Oriented Representation, Rule-Based Systems, Knowledge Acquisition, General Learning Model, Learning by Induction.

CSE 532 Data Structures and Algorithms

Programming Principles Such as Structuring, Looping, and Data Structures, Complexity Measures, Program Performance, Arrays, Queues, Stacks, Lists Trees, Searching, Hashing, Sorting, Traversal of Trees and Graphs, Emphasis on Typical Exercises and Examples.

CSE 533 Operating Systems

Basic Introduction to Operating Systems Regarding Their Relevant Design Techniques and Structuring Methods, Basic Concepts: Processes, Process Scheduling, Memory Management, File Systems, Input/Output, and Deadlocks, Prelude to Distributed Operating Systems in General, and Modern Systems in Particular Such as Object-Oriented Systems and Real-Time Systems.

CSE 536 Multimedia Systems

Multimedia Basics and Technology, Steps to Producing a Multimedia Application, Staffing and Skills for Multimedia Production, Multimedia Hardware, Designing The Application: Graphic Design, Capturing Still Images, Producing Full-Motion Videos, Creating Soundtracks, and Then Bringing All Together With Programming or Authoring, Object Oriented Multimedia Programming.

CSE 537 Programming Languages

Main Characteristics of Computer Languages, Languages Are Classified Into Imperial Languages Such as Java or C, Artificial Intelligence Languages Such as Prolog, Object Oriented Programming Languages and Parallel Architecture Languages.

CSE 538 Systems Analysis and Design

The System Process and Its Elements, The System Design Tools with Emphasis on Typical Design Examples, Modeling of Systems is Tackled with Stress on Its Tools and Scope, An Overview of Database, as An Element of System Analysis, Typical Complete Design Examples Are to Be Presented in This Course.

CSE 539 Information Systems

Systems and Organization, Information, Decision-Making and Models, Types of Information Systems, Networked Information Systems, Databases and Database Management Systems Multimedia and Imaging Database, Applications of Information Systems to Improve, Communication, Decision Making, The Use of Knowledge, Execution, and Products, Information System Planning, The System Life Cycle, System Development Approaches, Implementation for Effectiveness and Efficiency, Protecting Information Resources.

CSE 540 Advanced Software Engineering

This Course Presents Some Advanced Topics of Software Engineering Using Group Projects as The Basic Vehicle, Topics Covered Include Systems Planning, Managing Complexity, Requirements Specification, Architectural and Detailed Design, Design for Reusability, Reliability and Testability, The Tools and Environments.

CSE 542 Computer Networks (1)

Architecture of High Speed Network Protocols, Physical Layer Concepts and Network Access Methods with Emphasis on Optical-Based Techniques, Data Link Layer Concepts Using

Asynchronous Transfer Mode and Fast Switched Local Network Techniques, Inter-Networking Protocols with Emphasis on New Generation Internet, Transport Layer Protocols with Emphasis on Performance Issues, Application Layer Issues with Emphasis on Quality of Service for Multimedia Applications.

CSE 543 Computer Networks (2)

Traffic Characterization of Broadband Services, Packet Voice Modeling, Video Traffic Characterization, Multiplexing for Voice and Video, Bursty Traffic Models, Admission Control in Broad Band Network, ATM Switches (Output and Input Queuing, Multistage Switch Characteristics Performance Analysis), Congestion Control Mechanisms, Closed Loop and Rate-Based Traffic Control.

CSE 544 Network Applications

Multimedia Network Application Environment Including E-Mail, FTP, and Telnet, Searching Techniques Including Intelligent Agents, Hypertext and Hypermedia Transfer Protocol, Different Hypertext Makeup Languages Including Virtual Reality Makeup Language, Programming Languages for Networked Application.

CSE 545 Computer Network Management and Security

Computer Network Management Requirement and Systems, Network Monitoring Architecture, Performance, Fault, and Accounting Monitoring, Configuration Control, Internet Management Protocols, Simple Network Management Protocol (SNMP), Remote Network Monitoring (RMON), Models of Internetwork Security, Encryption Techniques and Systems, Authentication and Digital Signatures, Electronic Mail Security, Network Management Security, Internet Security Schemes.

CSE 546 Multimedia Networks

Distributed Multimedia Application Including Distance Learning and Video Conferencing, Networking Requirements for Multimedia Traffic, Architectures and Algorithms for Controlled Quality of Service, Operating System Support for Distributed Multimedia, Multimedia Protocol Architectures, Synchronization Representation and Traffic Service Modeling, Mechanisms for Achieving Synchronization.

CSE 548 Design of Compilers

Functions of a Compiler, Its Phases and Design Issues, Lexical Analysis, Parsing, Code Optimization and Code Generation, Each Compilation Phase is to Be Studied with Depth and Stress on The Theories, Algorithms and Design Examples, Programming Exercises Are Needed to Get The in-Hand Experience Required for The Students of Such Course.

CSE 549 Selected Topics in Computer Engineering

Selected Topics on Recent Developments in Computer Engineering Will Be Presented in This Course, Course Material Will Reflect The Needs of The Graduate Students and Their Research Activities.

CSE 550 Computer Interfacing and Peripherals

Basic Concepts, The Role of I/O, Memory Mapped I/O, Unconditional and Conditional Programming, Direct Memory Access (DMA), Evolution of I/O Systems Organization: I/O

Processors, I/O Channels, I/O System Support for Multiprocessors, Disk Technology, Disk Device, Simple I/O Transactions: Multiple Servers, Single Server Low Population (N), Disk Modeling, Multiprogramming Models and Inverted Servers, Improving I/O Response and Capacity, I/O Traffic and Virtual Memory Effects: Processor Memory Interfacing.

CSE 551 Knowledge Engineering

Knowledge Representation Using The Following Techniques: Formal Logic Including First Order Predicate Logic, Rule-Based Approaches, Semantic Nets, Frames, Conceptual Dependency, and Scripts, Representation of Knowledge Uncertainty Using Probabilistic and Fuzzy Based Approach, Knowledge Acquisition Techniques, Knowledge Processing and Language Support, Methodologies for Knowledge Information.

CSE 553 Database Systems

An Overview of Database Systems, Database Management System Architecture, Database Administration, Data Communication Manager, Distributed Processing, Relational Data Structure, Repeating Groups, Relation Integrity Rules, SQL Language, Database Design Using Entity-Relationship Modeling and Function Dependency, Concurrency, Security, Object Oriented Systems.

CSE 554 Computer Graphics

Graphics Hardware and Color, Displaying Images, Image Morphing, Texture Mapping Image, Composting, Line Drawing, Polygon Scan Conversion, Viewing, Hidden Surface Algorithms, Local Illumination Models.

CSE 555 Microprocessor Systems

Evolution of Most Common Microprocessors (Intel Series, Motorola Series), Architecture of 8-Bit Processors, Architecture of Advanced Processors, Microprocessor Busses (Data Bus, Address Bus, Control and Status Bus, Bus Multiplexing, Buffering), Microprocessor Machine Cycle and Timing, Microprocessor Interfacing, Memory Interfacing Peripherals Interfacing, I/O Organization, Interrupt Handling, DASD Interfacing, Basic Instruction Set of a Microprocessor, Applications in Industrial Embedded Systems.

CSE 556 Computer Architecture

Definition and Terms of Computer Architecture: Instruction Sets, Basic Data Types, and Addressing Modes, Memory Organization and Hierarchy: Virtual Memory and Cache Memory, Conventional Architectures, Pipelined Processors, Superscalar Processors, VLIW Processors, Parallel Array (Systolic) Processors, Re-configurable Parallel Array Processors, and Associative Processors, Massively Parallel Processors, Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors, and Hardware Multithreading, I/O Systems Organization, I/O Processors, I/O Channels, and I/O Support for Multiprocessors, Disk Modeling, Disk Cache Buffers, Concurrent Disks, Clusters of Independent Disks, Disk Arrays, and Redundancy in Disk Arrays.

CSE 558 Local Area Networks

General Architecture of Local Area Network, Modeling and Performance Evaluation of Local Access Protocols, Ring Network Models with Delay and Throughout Analysis, Random Access and Bus Networks, High Speed LANs and MANs Including: Fast Ethernet, FDDI and ATM, Local Area Network for Multimedia Traffic.

CSE 600 Theoretical Foundation of Computer and Systems Engineering

Linear Transformation and Canonical Forms, Sylvester Expansion and Cayley Hamilton Forms, Solution of Discrete Equation, Sets, Lattices and Boolean Algebra, Fuzzy Sets, Logic and Algebra, Fuzzy Functions, Mapping and Decomposition, Models for Computer Science: Automata and Grammars (Finite-State Automata, Non-Deterministic Models), Solvable and Unsolvable Problems, The Complexity of Computing, Formal Semantics (Operational and Denotational), Proving Program Properties, Non-Determinism and Parallel Computations, Introduction to Quantum Computation.

CSE 601 Modeling and Simulation

Discrete Event Simulation, Process Scheduling Approach, Event Scheduling Approach, Queuing Theory, Test Signals, Random Number Generators, Model Validation and Verification, Exposition to Simulation Packages, Case Studies.

CSE 602 Artificial Intelligence

AI Problems, AI Techniques, AI Applications: Production Systems, Search Programs, Heuristic Techniques, Representation and Mapping, Knowledge Representation Approaches: Predicate Logic and Natural Reduction, Procedural and Declaration Knowledge, Logic Programming, Expert Systems, Different Learning Methodologies, Connections Models, Genetic Algorithms, Fuzzy Logic Evolutionary System.

CSE 610 Systems Modeling and Identification

Overview of The Importance of System Modeling and Identification in Prediction, Control, and Signal Extraction, System Models in Time and Frequency Domains: Linear/Nonlinear, Parametric/Nonparametric, Discrete/Continuous, Input-Output/State-Space, Deterministic/Stochastic, Lumped/Distributed, Stochastic Processes and Linear System I/O Relationship and Properties in Time and Frequency Domains, Impulse Response Identification and Correlation Method, Frequency Response Identification and Sources of Errors, Input Design and Persistence of Excitation, Problems with Feedback Control, Time Domain System Model Parameters Estimation and Basic Least Square Method, Sequential Least Squares, Extended and Total Least Squares, Maximum Likelihood.

CSE 611 Real-Time Computer Control

Introduction, Synchronous Programming, Motor Speed Control Running in a Real Time, Time and Clock Implementation, PI Control, Asynchronous Signal Processing, Pulse Width Modulation, Pulse Frequency Modulation, Quadrature Decoding, Multiple Timers in Software, Cascade Control, DATA Structures, Multiple Independent Processes, Operator's Console, Console Devices, Serial Interface, Priority Scheduling, Event Driven Scheduling, Task Control, Task Structure, Task Organization and Scheduling for a Control System.

CSE 612 Stochastic Process Control

Probability and Random Variables, State Space Models, Properties of Linear Stochastic Systems, Controlled Markov Chain Model Input-Output Model Estimation and Control, Linear Gaussian Model, Linear Quadratic Gaussian Problem (LQG), Minimum Variance Control of ARMAX Models, State Controller for Stochastic Disturbances, Optimal State Estimation (Kalman Filter), System Identification: Maximum Likelihood Estimator,

Parameterization of System Models, Adaptive Control, Bayesian Adaptive Control, Self Tuning Regulators, MATLAB Assignments.

CSE 613 Microprocessor-Based Systems

Basic Software Introduction to Intel Microprocessors, Switches and LED's Interfacing-8255PPI-Keyboard Interface Using 8279PPI-8254, Timers and Counters Interfacing, DC Motor Speed and Direction Control, Stepped Motor Speed and Direction Control, ADC and DAC Interfacing.

CSE 614 Robots and Manipulators

Direct Kinematics Modeling of Robot Manipulators, Dynamic Modeling of Industrial Robot Arms, Identification, Simulation, Programming and Control of Industrial Robot Arms, Classification and Specification Characteristics of Industrial Robots.

CSE 615 Intelligent Control Systems

Introduction to Intelligent Control, Fuzzy Logic, Possibility Theory, Fuzzy Modeling, Fuzzy Logic Controller Structure and Design, Static Fuzzy Logic Controller, Self Organizing Fuzzy Logic Controllers, Case Studies of Adaptive Fuzzy Controllers, Neural Networks, Different Models of Neural Networks, Neural Control, Neuro-Fuzzy Systems, Genetic Algorithms and Their Application in Intelligent Control, MATLAB Assignments.

CSE 616 Neural Networks and Their Applications

Introduction, Models of Neurons, Network Architecture, Learning Process: Error-Correction Learning, Hebbian Learning, Supervised Learning, etc, Distributed Memory Mapping, Correlation Matrix Memory, Perceptron Convergence Theorem, Multi-Layer Perceptrons, Back-Propagation Algorithm, Accelerated Convergence, Case Studies.

CSE 617 Digital Image Processing

Properties of The Digitized Image, Data Structures for Image Analysis, Image Restoration, Image Segmentation, Shape Representation and Description, Object Recognition, Image Understanding, Discrete Image Transforms, Image Compression.

CSE 618 Pattern Recognition

Formulation of The Pattern Recognition Problem, Statistical and Syntactic Approaches, Parametric Classifiers and Bayesian Decision, Non-Parametric Classification, Discriminate Analysis, Cluster Analysis, Recognition Grammars, Scene Analysis.

CSE 619 Selected Topics in Control and Systems Engineering

This Course Will Present Selected Topics Related to The Current Need of Graduate Students, It Also Covers Recent Developments in Control and Systems Engineering.

CSE 620 Advanced Computer Architecture

Advances in Computer Architecture, Advanced Techniques in Processor Design: Precise Interrupts, Superscalar, Superpipeline, Very Long Instruction Word (VLIW), Multithreading, Stack Architectures, Systolic Arrays, Associative Processors, Hazard Detection and Resolution, Branch and Data Prediction, Architectural Performance Analysis, High-level

Language Architectures, Operating System Support, Impact of VLSI Technology, Application-Directed and Software-Oriented Architectures.

CSE 621 Expert Systems

Introduction: Intelligent Machines, Artificial Intelligence, Introduction to Expert Systems, Major Characteristics of Expert Systems: Expert System Structure, Characteristics of an Expert System, Conventional Programming Versus, Knowledge Engineering, Knowledge Representation: Representation Techniques, Logic Inference Techniques: Rule-Based Systems, Frame Based Expert Systems, Knowledge Acquisition.

CSE 622 Advanced Computer Networks

Network Architecture: Protocols and Services, High-Speed Networks: ATM Networks, Traffic Characteristics and Models, Congestion and Flow Control Mechanisms, New Trends in Network Applications and Their Impacts on The Network Architecture: Multimedia-Video Conferencing-Video-On-Demand and Real-Time Applications, Network Management Functions and Standards: ISO and Internet Models, Network Security Problems and Schemes.

CSE 623 Computer Graphics and Visualization

Introduction, Local Illumination, Global Illumination, Anti-Aliasing, Wavelets, Geometric Algebra, Curves, Surfaces, Animation Principles, Kinematics, Natural Phenomena.

CSE 624 Distributed Database Systems

Features of Distributed Versus Centralized Database, Distributed Database Management System, Architecture for Distributed Database, Types of Data Fragmentation, Distributed Transparency for Read Only Application, Distributed Transparency for Update Applications, Distributed Database Access Primitives, Integrity Constrains, Distributed Database Design, Queries, Optimization of Access Strategies, Concurrency and Reliability Control.

CSE 625 Distributed Operating Systems

The Course Surveys Basic Communication Issues of Distributed Systems and General Characterizing Features of Distributed Operating Systems W.R.T, Network Operating Systems, Basic Design Issues Relevant to Distributed Operating Systems Are Tackled Such As: Inter-Process Communication, Synchronization, Addressing and Naming, Protection and Security, and Deadlock Detection and Resolution, It Ends Up With a Survey of Typical Experimental Distributed Operating Systems, with Emphasis on Real-Time and Object-Oriented Systems.

CSE 626 Natural Language Understanding

Syntactic Processing (Parsing Techniques, Grammars for Natural Languages), Semantic Interpretation Strategies, Context and World Knowledge (Knowledge Representation, Discourse Structures, Belief Models and Speech Acts), Response Generation (Question-Answering Systems, Natural Language Generation), Introduction to Machine Translation (Knowledge-Based and Statistical Approaches), Speech Understanding Systems.

CSE 627 Computer and Network Security

Different Levels of Data Security Inception Algorithms and Cryptographic Techniques Including Block and System Ciphers, Key Management, and Digital Signature, Access

Control Mechanism, Information Flow Control Mechanism Inference Controls, Operating System Security Aspects, Network and Internetwork Security Including Electronic Mail and Network Management Security.

CSE 628 Computer Network Management

Computer Network Management Requirements and Systems, Network Monitoring Architecture, Performance, Fault, and Accounting Monitoring, Configuration and Security Control, Network Management for TCP/IP Protocol, The Simple Network Management Protocol (SNMP), SNMP Basic Concepts and Transport-Level Support, Remote Network Monitoring, Security Issues, Extensions of The Protocol, OSI System-Management Concepts Including Framework and Functional Areas, System Management Functions Including Object, State, and Relationship, Alarm and Even Reporting, Access Control, Workload and Test Monitoring Functions.

CSE 629 Selected Topics in Computer Engineering

Selected Topics on Recent Developments in Computer Engineering Will Be Presented in This Course, Course Material Will Reflect The Needs of The Graduate Students and Their Research Activities.

CSE 630 Virtual Reality

Introduction to Virtual Environment Systems, Visual Auditory, Haptic Environment System, Physiology and Perception in Virtual Environments, Intestrated and Desktop Virtual Reality (VR) Systems, Distributed VR Systems, Software and Operating Shells for VR, VR Displays, Position and Orientation Tracking, Interaction with Visual Objects, Theory of Light/Object Interaction, Shadow Generation, Texture Mapping and Modeling, Ray Tracking, and Animation Techniques.

CSE 631 Distributed Multimedia Systems

Basic Elements of Multimedia Information Systems, Multimedia Spatial and Temporal Models, Traffic Characterization and Effect of The Different Compression Techniques, Multimedia Networking and Quality-Of-Service Requirements, High Speed Networks Satisfying Multimedia Requirements, Distributed Multimedia Database Systems, Operating System Support for Multimedia Applications, Synchronization Issues in Multimedia Communications Including: Reference Models and Their Specifications, Synchronization Representation and Traffic Source Modeling.

CSE 632 Advanced Programming Languages

The Course is Designed to Make The Student Fluent in Several Radically Different Classes of Programming Languages (PL) Such As: Imperative PL, Declarative PL, Functional PL and Object Oriented PL, Stress on The Semantics of The Studied PLs is Also Presented in This Course, Representative Languages of Each Class Will Be Considered Such As: C, Prolog, C++, SMALLTALK.

CSE 633 Quantum Computation and Communication

Basic Concepts: Historical Perspective, Quantum Bits, Quantum Computation, and Quantum Algorithms, Introduction to Quantum Mechanics: Linear Algebra, the Postulates of Quantum Mechanics, Superdense Coding, the Density Operator Formalism, Schmidt Decomposition and Purification, and Quantum Entanglement, EPR Pairs, and Bell' Inequality, Quantum

Circuits: Single Qubit Operations, Controlled Operations, Measurement, Universal Quantum Gates, and Two-Level Unitary Gates and Universality, Quantum Fourier Transform: Definition of The Quantum Fourier Transform, Phase Estimation, and Order Finding and Factorization, Quantum Search Algorithms: The Quantum Search Algorithm, Quantum Search of An Unstructured Database, Elements of Physical Realization of Quantum Computers: Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Cavity Quantum Electrodynamics, Quantum Noise and Quantum Operations: Quantum Operations, and Examples of Quantum Noise and Quantum Operations, Distance Measures for Quantum Information: and Trace Distance and Fidelity, Quantum Error Correction: The Three Qubit Bit-Flip and Phase-Flip Code, the Shor Code, Constructing Quantum Codes, and The Steane Code, Entropy and Information: Shannon Entropy and Its Basic Properties and Von Neumann Quantum Entropy, Quantum Information Theory: Distinguishing Quantum States and The Holevo Accessible Information, Schumacher's Quantum Noiseless Channel Coding Theorem, Entanglement as a Physical Resource, Quantum Cryptography (Privacy Amplification and Information Reconciliation and Quantum Key Distribution).

CSE 634 Digital Video Processing

Representation of Digital Video, Time Varying Image Formation Models, Spatio-Temporal Sampling, Two-Dimensional Motion Representation, Three-Dimensional Motion Estimation and Segmentation, Video Filtering, Still Image Compression, Video Compression.

CSE 635 Advanced Operating Systems

Modern Operating Systems Which are Mostly Object-Oriented and/or Real-Time Systems, Foundation for Studying Modern Distributed Operating Systems, Object-Oriented System Design Issues are Surveyed Such As Objects, Object Architecture, Accessing Objects, Relations and Operations, Fault Tolerance, and Exception Handling, Real-Time Related Topics Such As Adding Time to Objects, Calendars, Time Projection, Scheduling and Verification of Schedulability, The Above Issues Are Handled in A Comparative Way with Respect to Classic Process Oriented Design Approaches.

CSE 638 Biometrics

Introduction to Biometrics, How to Evaluate Biometrics Systems, Face Recognition, Facial Gender Classification, Ethnicity Classification, Facial Expression Recognition, Fingerprint Recognition, Voice Recognition, Iris Recognition, Ear Recognition, Vein Recognition, Palm Recognition, Gait Recognition, Signature Verification.

CSE 639 Computational Biology

Review of Biology; Evolutionary Models; Sequence Alignment; Dynamic Programming; Linear Time String Searching; Suffix Trees; String Preprocessing; Database Search; Hashing; Random Projections; Biological Signals; HMMs; Simple ORFs; Learning with HMMs; Expression Analysis; Multi-dimensional Clustering; Feature Selection; Gibbs Sampling; Expectation Maximization; Biological Networks; Graph Algorithms; Phylogenetic Trees; Greedy Algorithms; RNA Folding; Context-free Grammars; Phylo-CFGs; Combine Alignment and Feature Finding; Gene Finding; microRNA Regulation; Target Prediction; Regulatory Relationships; Bayesian Networks; Generative Models of Regulation; Bayesian Graphs; Genome Assembly; Euler Graphs; Genome Duplication; Genome Rearrangements.

CSE 640 Digital VLSI Systems

Overview of VLSI Technology, VLSI Design Methodology and Design Options, System Design, Simulation, and Synthesis Using Hardware Description Languages (VHDL and Verilog), Ad-hoc and Structured Design for Testability Techniques, System Components, Arithmetic Circuits, Memory and Programmable Logic Devices, and Clocking, Systems Design Examples from Communications and Arithmetic Circuits, CAD Tools, CMOS and NMOS Gate Circuit and Logic Design, IC Processing, Interconnect Modeling, Design of Basic Digital IC Building Blocks, Memory Cores: ROM, EPROM, EEPROM, Flash ROM, SRAM, DRAM, Memory Peripheral Circuitry: Row and Column Decoders, Array Structures.

CSE 641 Digital Systems Testing

Cost and Complexity of Logic Testing, Testing at Different Levels of Abstraction, Faults, Physical Fault Modeling, Stuck-at Fault Models, Single Fault Models, Undetectable (Masked) Faults, Fault Equivalence/Collapsing, Testability Measures: Controllability and Observability, Combinational and Sequential Functional Test, Exhaustive Test, Sensitized Path Test, Test CoverageEevaluation, Test Pattern Generation, Fault Simulation, Design for Testability (DFT), Ad-hoc DFT, Scan Design, Built-in Self Test (BIST), Linear Feedback Shift Register (LFSR), Data Compaction Using LFSR, Pseudo Random Number Generation (PRNG), Boundary Scan/Joint Test Access Group (JTAG), Current test.

CSE 642 CAD for Digital Circuits

Overview of Electronic Design Automation (EDA), Evolution of Design Methodologies from Systems-on-a-Board (SoB) to Systems-on-a-Chip (SoC), Chip Manufacturing Process and IC Packaging, IC Design Flow: Design Entry, Logic Synthesis, System Partitioning, Floorplanning, and Placement, Pre and Post Layout Simulation, Circuit Extraction, Event-Driven Simulation, Delay Models, Hardware Description Languages: VHDL and Verilog, Logical Design and Physical Design, IP (Intellectual Property)/Core-Based Design, Mixed Signal Integration and Design.

CSE 643 Embedded Computer Systems

Overview of Embedded Systems Architecture and Components, Design of Embedded Systems Using Real Time Hardware and Software Components, Communicating, Linking, Interfacing, and Processing Techniques for Embedded Systems, Programming Models: Disciplines, Methods, and Development, Machine Instruction Format and Instruction Timing, Interface between OS, ISA, and RTL Layers of the Virtual Machine Model, Interrupts, Privilege States, and Exception Handling, Algorithm Analysis of Embedded Programs.

CSE 644 Parallel Computer Systems

General Formalism and Description of Parallel Systems, Sequential and Parallel Execution, Synchronization, Principles of Pipeline and Vector Processing, SIMD and MIMD Machines, Multi-Stage Interconnection Networks, Routing (e-cube, Hyperswitch, Wormhole, Virtual Channels) and Flow Control in Interconnection Networks, Shared Memory and Cache Coherence, Data Flow Computers (Macro and Micro Data Flow), Design of Systolic Array-Based Systems: Dependence Graph, System Timing, Projection and Scheduling, Data Broadcasting and Pipelining.

CSE 645 Cluster Computer Systems

Overview of Massively Parallel and Cluster Computers, Clusters and Networks of Workstations, Dependability and Scalability, Processing Models (Shared Memory Versus Message Passing), Processes and Threads, Standard Algorithms Utilizing Parallelism, Matrix and Vector Operations, Collective Communications, Parallel Application Environments: MPI and OpenMP, Network Topology and Interconnection Networks, Designing a Cluster Computer System, Cost of Cluster Architectures, Storage Area Networks.

CSE P98 Project (1)

CSE P99 Project (2)

10. Department of Design and Production Engineering

MDP 500 Noise Control

Sound Waves and Their Measurements, Behavior of Sound Waves, Units of Sound Measuring and Measuring Systems, Selection of Instrumentation, Fundamentals Underlying Noise Control, Sound Propagation Outdoors and in Small Enclosures, Properties of Acoustical Materials, Damage Risk for Hearing, Practical Noise Control, Noise Control of Engines, Machines, Workshops and Transportation.

MDP 501 Theory of Machines

Vectors in Plane and in Space, Kinematics of Mechanisms, Simple Mechanisms, Gears, Cams, Hook`S Joint, Static Analysis of Mechanisms Without and with Friction Consideration, Dynamic Analysis of Mechanisms, Balancing of Rotating Masses, Balancing of Reciprocating Masses.

MDP 505 Statistical Quality Control (1)

Measures of Central Tendency and Dispersion, Probability Distributions, Theory of Control Charts, Variables Control Charts, Attribute Control Charts, Sampling By Attributes.

MDP 511 Bulk Materials – Experimental Techniques

Introduction to Materials Structures and Microstructure, Defects and Imperfections, Structural Identification, Crystallographic Phase Identification, Investigation of Morphology, Mechanical Properties of Materials, Nanoindentation, Thermal Properties of Materials, Electrical Properties of Materials, Charge Carriers and Conduction, Semiconductor Materials and Devices, Magnetic Properties of Materials, Superconductors, Optical Properties of Materials, Optical Fibers, Systems and Devices, Luminescence, Nanoparticles and Characterizations.

MDP 512 Advanced Ceramic Materials

Review of Ceramic Applications, New Applications, Development of Fuel Efficient and Environmentally Friendly Vehicles, Miniaturized High-Tech Electronics, Crystal Structures and Properties of Ceramics, Mechanical, Thermal, Electric, Magnetic and Optical Properties, Practical Applications, High Temperature Applications, Corrosive Environment and in Highly Stressed Mechanical Application, Electronic Applications, Insulators, Dielectrics, Piezoelectric and Magnets Are Described, Ceramic Structures, Possibilities and Limitations in Harsh Environments, Ceramics As Components Rather Than As Bulk Materials, Processing of Ceramics, Raw Materials, Powder Preparation, Forming Via Sintering.

MDP 513 Polymer Materials

Introduction to Polymer Materials, Reaction From Monomer to Polymer, Characterization of Polymer Melts, Cooling Process of Polymers, Structure of Polymer Materials, Mechanical Behavior, Thermal Behavior, Electrical Properties, Optical Properties, Introduction to Fiber Reinforced Polymer Composites, Cross-Linked Thermoset Polymers, Fibers, Textile Semi-Finished Products, Basic Characterization of Composites and Correlation with Isotropic Materials, Basic Design.

MDP 514 Failure Analysis of Mechanical Components

Strength of Materials and Kinds of Failure, Importance of Failure Analysis, Conditions for The Occurrence of Failures and Causes of Failure, Procedure of Failure Analysis, Fatigue

Failure, Corrosion Failure, Failure Caused By Faulty Materials Selection, Failure Caused By Processing Error, Service Overload Failure.

MDP 515 Materials Characterization

Introduction, Microstructure of Materials By Optical Microscopy and Image Analysis, Electron Microscopy (SEM), (TEM), (EBSD) and Material Texture Analysis, Diffraction Methods in Characterization, Optical and X-Ray Spectroscopy, Special Characterization Techniques for Polymers (Thermal Analysis, Viscosimetry, Crystallinity Determination, Chromatography, Stress-Relaxation Experiments, Creep Analysis).

MDP 516 Engineering Metallurgy

Metals and Metal Interaction, Atomic Structure, Crystallization of Alloys and Phase Diagrams, Metals and Alloys Properties and Applications, Ferrous and Non-Ferrous Alloys, Heat Treatment, Powder Metallurgy.

MDP 517 Materials and Process Selection

Introduction, The Design Process, Engineering Materials and Their Properties, Families of Engineering Materials, Materials Property Charts, Materials Selection: The Basics, Selection Strategy, Selection Procedure, Materials Selection Case Studies. Processes and Process Selection: Process Selection Case Studies. Selection of Materials and Shape: Selection of Materials and Shape Case Studies. Hybrid Materials, Materials and Economy, Materials and The Environment.

MDP 518 Modeling and Simulation of Materials

Linear Numerical Modeling, Modeling of Nonlinear Behavior, Modeling of Specific Structures, Materials States and Ageing Effects, Modeling of Manufacturing Processes, How to Model Advanced Materials.

MDP 519 Light Alloys

Production of Aluminum, Magnesium and Titanium Alloys, Physical Metallurgy of Aluminum, Its Alloys: Cast Alloys, Properties, Effects of Alloying Elements, Heat Treatment, Modification of Properties, Corrosion Resistance. Magnesium and Its Alloys: Cast Alloys, Effect of Alloying Elements, Grain Refinement, Corrosion Resistance, etc. Titanium and Its Alloys: Casting, Engineering, Performance and Application Fields, Joining Technologies Such As Friction Stir and Laser Welding. Novel Materials and Processing Methods: Composites, Metallic Foams, Rapid Solidification Processing, etc.

MDP 520 Casting Processes

Liquid Metals and Alloys, Melting and Melt Treatment, Wrought and Cast Alloys, Casting of Primary Alloys (Cast House), Cast Shaped Parts: Foundry, Cast Shop, Properties and Defects of Castings, Quality Control in Casting, Hazardous and Environmental Effects of Casting Plants.

MDP 521 Polymer Processing

Preparation of Plastics, Fundamentals of Processing Behavior, Extrusion Technology, Injection Molding, Compression Molding, Fiber Composite Technology, Foaming, Joining Technology.

MDP 522 Powder Metallurgy

Introduction to Powder Metallurgy, Powder Characterization, Powder Fabrication, Precompaction Powder Handling, Precompaction Concern, Mixing and Blending Approaches, Compaction, Sintering, Full Density, Processing, Compact Characterization, Applications.

MDP 523 Thermodynamics of Materials

Introduction to Classical Equilibrium Thermodynamics and The Equation of State, Energy and Work, Thermodynamic Properties, First Law of Thermodynamics and Its Applications to Constant Pressure Processes, Second Law of Thermodynamics and Introduction of Entropy, Introduction of Auxiliary Functions Including Enthalpy, Helmholtz Free Energy, Gibbs Free Energy, Third Law of Thermodynamics and The Calculation of Heat Capacity, Enthalpy and Entropy, Chemical Potential and Phase Equilibria in One Component Systems, Equilibrium of Chemical Reactions, Relation Between Free Energies and Phase Equilibria in Binary Systems, Binary Phase Diagrams, Level Rule and Gibbs Phase Rule, Electrochemistry, Half-Cell Reactions, Cell Voltage, Concentration Cells, Polymer Thermodynamics.

MDP 524 Joining and Welding Processes

Principles, Classification, Metallurgical Welding, Gas Flame Processes, Arc Processes, Resistance Welding, Brazing and Soldering, Advanced Welding, Related Processes, and Others, Adhesive Bonding and Mechanical Fasteners, Manufacturing Techniques Concerning Welding and Joining, Hazardous and Environmental Considerations.

MDP 525 Mechanical Behavior of Materials

Solid Structures, Atomic Architecture, Atomic Bonds, Atomic Forces, Packing of Atoms, Crystal Defects, Plasticity of Crystals, Yield Strength For a Perfect Crystal, Dislocation Motion, Edge Dislocation, Screw Dislocation, Forces on Dislocation, Dislocation Multiplication, Work Hardening, Dislocation Velocity, Moving Dislocation, Plastic Deformation in Single and Polycrystalline Materials, Equilibrium Diagrams, Elastic Behavior, Thermoelasticity, Viscoelasticity, Elastoplasticity.

MDP 526 Introduction to Nanomaterials

The New Concepts of Nanotechnology and The Change Into a New Interdisciplinary Paradigm Contemporary and in Line with Students, Future Studies Will Be Discussed, Recent Scientific and Technology Work in The Nano World Will Be Presented to Demonstrate The Potential of Nanoscience and Industrial Applications of Nanotechnology.

MDP 527 Materials and Technologies for Repair of Engineering Components

Properties and Behavior of Engineering Materials and Components, Defects in Solids and Types of Imperfections, Analysis of Materials and Component Failure, Misuse and Abuse, Assembly Errors, Manufacturing Defects, Improper Maintenance, Fastener Failure, Design Errors, Improper Material, Improper Heat Treatments, Unforeseen Operating Conditions,

Inadequate Environmental Protection, Inadequate Quality Assurance, Casting and Welding Discontinuities, Surface Engineering, Repair and Protection Methods and Materials, Impregnation, Joining, Adding Layer, Standards Specification and Using Data Base of Engineering Know How.

MDP 528 Optimization of Life Cycle Cost

Life Cycle Analysis, Life Cycle Reliability, Critical Factors in Life Cycle Analysis, Decision-Based Model, Solution of Optimization of Life Cycle Cost Problems.

MDP 530 Computer Aided Mechanical Design

Principles of Computer Aided Design, The Design Process, Analysis, Visualization and Synthesis, Design Benefits, Principles of Design Softwares, Computer Graphics, Computer Aided Curve and Surface Design. Optimum Design: Single and Multi-Variable Optimization, Design Methods, Computer-Aided-Design, Applications.

MDP 531 Theoretical Basis for Design

Materials Selection and Implication on Life Cycle, Rational Design Under Normal and Elevated Temperatures, Fatigue, Creep, Design for Rigidity and Application to Machine Tool Design.

MDP 532 Practical Basis for Design

Manufacturing Considerations, Design for Casting, Design for Welding, Design for Light Weight, Assembly Considerations and Application to Engine Design, Codes of Practice and Specifications, Design of Prototype and Acceptance Tests.

MDP 534 Advanced Stress Analysis

Introduction to Stresses and Strains, Static and Dynamic Stresses, Behavior of Different Materials Under Different Types of Stresses, Thermal Stresses, Behavior of Different Materials Under Heating and Cooling, Impact Stresses.

MDP 535 Reversed Engineering

Inspection of The Product and Its History in Operation, Striping The Product to Deduce Its Function, Determination of Control Dimensions (Functional, Usage, Mounting,...), Testing of Materials in View of Standard Techniques and Material Standards, Preparation of Design Documents in View of Available Capabilities, Testing Techniques for The Rival Products.

MDP 540 Production Process Control Technology

Introduction with Some Important Automatic Control Systems, Process Dynamics, Process and System Responses Using Direct. Solution of D.E., Laplace Transfer and Convolution Integral, Industrial Process Control Components: Controller Design, Implementation and Testing, Final Control Elements, Stability, System Performance in Time and Frequency Domains (Polar Plots, Bode Diagrams, Frequency Response), Controller Tuning Using Important Tuning Criteria, System Compensation Techniques, Cascaded Control Systems, Relay Control Systems, Introduction to Nonlinear Systems.

MDP 541 Digital Control (1)

ADC and DAC Design and Principles, Digital Signal Models and Z Transforms, Discrete Transfer Functions, Representation of Digital Systems with Difference Equations, Analysis of Discrete Control Systems, Using Microcontrollers for Controlling Industrial Systems (Hardware Design and Assembly Programming), Using The Programmable Logic Controllers (Hardware and Software), Industrial Application on Microcontrollers and PLC Control Systems (Industrial Data Acquisition and Control Cards), Programming in Assembly and Some High Level Languages.

MDP 542 Robotics

Robot Kinematics, Position and Orientation of Rigid Body, Homogeneous, Transformation, Modeling of Manipulator Arms, (Denavit, Hartenberg Notation), Inverse Kinematics, Manipulator Jacobean. Robot Static, Force and Moment Analysis and Transformation, End Point Compliance Analysis (Stiffness), Robot Dynamics: Formulation of Dynamic Equation Using (Newton, Euler and Lagrangian), Inverse Dynamics (Recessive Computation), Trajectory Control: Sliding Surface, Switched Control Lows, Robust Control, Compliant Motion Control, Passive and Active Compliance, Impedance Control, Dynamic Hybrid Control in End Effector Space.

MDP 543 Mechatronics (1)

Overview of Mechanisms in Mechatronic System, Mechatronic Control System Structure, Microprocessor Basic System, Design of Logic Mechatronic System (Logic Gates, Boolean Algebra, Reduction of Truth Table, Combinational System, Sequential System), Design of Microcontroller Based Control System (Application I/O, Interfacing, Microcontroller Programming), Programmable Controller (Structure, PC Modules, Relay-Ladder Logic, PC Ladder Logic, Programming of PC Using Different Languages), Design of Computerized Control System, Industrial Applications.

MDP 544 Pneumatic and Hydraulic Control (1)

Introduction to Pneumatic and Hydraulic Control Systems (Review to The Basic Principles of Hydraulics and Pneumatics), Hydraulic and Pneumatic Equipment (Pumps, Compressors, Cylinders, Motors, Valves: Pressure Valves, Directional Control Valves and Flow Valves, Cartridges, Accelerators, Pressure Switches), Principle of Pneumatic Switching, Pneumatic Logic, Pneumatic Sequence, Pneumatic Sequence Techniques (Breakdown of Cycles, Operating Modes, Simultaneous Cycles, Optional Cycles), Industrial Applications.

MDP 545 Servo Mechanisms

Introduction and Definitions, Characteristics of Servomechanisms, Analysis of Servomechanisms, Servomechanism Design Using The Frequency & State Space Methods and The Theories of The Optional Control Criteria. Hydraulic Servos, Digital Servos, Single and Multi Digital Working Heads. Electrical Servo Design, Hardware and Software.

MDP 546 Automation of Production Lines

Introduction in Line and Branched Production Lines, Classification According to The Function and Material Transfer Methods, Sensors and Power Units in Working Heads, Material Transfer Methods (Electrical, Pneumatic, Hydraulic, Mechanical....Etc.), Types of Working Heads (Manufacturing, Monitoring, Packaging... etc.) Control Methods and

Coordination in Production Lines, Design of Working and Monitoring Panels, Design of The Electric and Electronic Control Unit, Design and Synthesis of Work Heads in Mechanics.

MDP 547 Automatic Control of Mechanical Equipment

Introduction to The Motion of Mechanism in Plane and Space, Mechanism Dynamics and Modeling, Design of Digital Control Units of The General Purpose Type, Multi Degree of Freedom Control Units, Control System in The Classical Workshop Equipment, Numerical Control in Machine Tools and Workshop Equipment Based on Programmable Equipment (Microprocessors, PLC's, PC's), Control in Material Handling Equipment and Complete Stores Automation, Introduction to The FMS.

MDP 550 Metal Forming Processes

Free and Die Forging, Sheet and Section Rolling, Direct Indirect, Combined and Hydraulic Extrusion, Dry and Wet Wire Drawing, Tube Drawing Without Internal Support, Using Internal Support By Mandrel, Using Internal Support By Floating and Fixed Plug, Deep Drawing, Stretch Forming, Ironing, Metal Spinning, Flow Forming, Sheet Metal Work, Cold Roll Forming.

MDP 551 Metal Forming Machines

Principal Types and Capacities, Methods of Operation, Design of Their Main Elements Such As Body, Frame, Sides, Cylinders, Rods, etc., Power Transmission and Control, Safety Devices That Will Include Different Types of Hammers, Presses, Rolling Mills, Wire Drawing and Tube Drawing Machines, Non Conventional Machines, etc.

MDP 552 Metal Forming Tools and Accessories (1)

Various Types of Tools and Accessories Used in Metal Forming Processes Such As Free and Die Forming, Flat and Section Rolling, Direct, Indirect, Combined and Hydraulic Extrusion, Dry and Wet Wire Drawing, Tube Drawing Without Internal Support, Using Internal Support By Mandrel, Using Internal Support By Floating and Fixed Plug, Deep Drawing, Stretch Forming, Ironing, Metal Spinning, Flow Forming, Sheet Metal Work and Cold Roll Forming, Non Conventional Forming Processes, etc.

MDP 553 Non Conventional Metal Forming Processes

High Energy Rate Forming, Explosive Forming, Electro Hydraulic Forming, Electro Magnetic Forming, Super-Plastic Forming, Rubber Pad Forming, High Speed Pneumatic and Mechanical Forging, Dynapak, Petroforge Water Hammer Forming and Fuel Combustion Forming, Three and Four Rolls Forming, etc.

MDP 554 Metal Forming Dies

Roll Pass Design, Cold Roll Forming Rolls, Extrusion Dies, Open and Closed Die Forging, Wire, Rod and Tube Drawing Dies, Deep Drawing Dies, Stretch Forming Dies, Metal Spinning Dies, High Energy Rate Forming Dies, Explosive Forming Dies, Electro Hydraulic Forming Dies, Electro Magnetic Forming Dies, etc.

MDP 555 Theory of Metal Forming

Mechanical and Metallurgical Fundamentals, Analysis of Stress and Strain, Criteria of Yielding, Theoretical Analysis of Metal Forming Processes, Dimension Changes During

Forming Processes, Calculations of Forming Loads, Slip Line Field Theory, Uniform Work of Deformation, Slab Method, Upper Bound Solutions, Study of Parameters Affecting Processes That Will Include The Following Metal Forming Processes: Forming, Rolling, Extrusion, Wire Drawing, Tube Drawing and Deep Drawing.

MDP 556 Product Design & Development

Introduction, Processes, Product Planning, Customer Needs, Specifications, Concept Generation, Selection and Testing, Product Architecture, Product Design, Product Manufacturing, Prototyping, Intellectual Property, Economics and Management.

MDP 557 Industrial Innovation

Definitions, Concepts, Structural Process, Globalization, Branding Marks, Economics, Planning, Market, Work Teams, Manufacturing, Role of Technology Transfer, Prototyping, Culture Effect, Knowledge, Environment, Intellectual Property Rights "IPR", Risks, Venturing, Outsourcing, Management and Governmental Policies.

MDP 560 Numerically Controlled Machine Tools (1)

Introduction to Types of Machine Tools, Main Parts of Numerical Control, Interpolators, Programming Methods, Applications on Manual Programming (Positioning, Linear, Circular, Loops, Canned Cycles, Subroutines).

MDP 561 Non-Conventional Machining Processes

Introduction to Non Conventional Machining Processes, Energy Utilization. Mechanical Processes: Ultrasonic Machining, Ultrasonic-Aided Machining, Electrical Processes, Electrochemical Machining, Thermal Processes, Chemical Processes, Combined and Hybrid Non Conventional Machining Processes.

MDP 562 Cutting Tool Design

Cutting Tool Materials, Requirements of Cutting Tool Materials, Design of Single Point Cutting Tools (Turning, Shaping), Form Turning Tools (Flat, Circular), Drilling Tools (Twist Drill, Flat Drill, Gun Drill), Reamers Broaching Tools, Milling Cutters (Plain and Face Milling Cutters, End Mills), Form Relieved Milling Cutters, Gear Cutting Tools, Thread Cutting Tools (Taps, Dies, Turning and Milling Tools), Grinding Wheels, Optimum Cutting Conditions for Different Cutting Tools.

MDP 563 Hydraulic and Pneumatic Equipment for Machine Tools

Hydraulic Principles, Pumps, Hydraulic Valves, Hydraulic Cylinders and Actuators, Hydraulic Systems, Maintenance of Pneumatic and Hydraulic Equipment and Systems.

MDP 564 Computer Aided Manufacturing

Scopes of Utilization of Computer Aided Manufacturing, Expert Systems in CAM, Languages for Computer Aided Manufacturing, Integration Between CAD and CAM, Data Bases Needed for Manufacturing Applications.

MDP 565 Jigs and Fixtures

Definitions, Advantages of Jigs and Fixtures, Principle of Six Point Location, Types of Locators, Clamping Elements, Clamping Force Calculation, Design of Drilling Jigs, Types of

Jigs, Jig Bushes, Design of Machining Fixtures, Milling Fixtures, Turning Fixtures, Indexing Jigs and Fixtures, Broaching Fixtures, Grinding Fixtures, Boring Fixtures, Assembly Fixtures, Materials of Jig-And-Fixture Elements, Economics of Jigs and Fixtures.

MDP 566 Theory of Metal Cutting (1)

Concepts and Definitions, Materials and Geometry of Cutting Tools, Cutting Forces and Power Consumption in Turning, Drilling and Milling, Heat in Metal Cutting, Tool Failure, Cutting Fluids, Chatter, Surface Roughness, Machining Cost, Optimization of The Machining Variables, Machinability.

MDP 567 Machining Processes (1)

Classification, Cutting Conditions, Machining Time, Machining of External Surfaces of Revolution, Machining of Internal Surfaces of Revolution, Machining of Flat Surfaces, Broaching of Internal and External Surfaces, Grinding of Internal and External Surface, High Precision Finishing Processes.

MDP 568 Machine Tools (1)

Machine Tool Classification, Design of Speed and Feed Gearboxes, Design of Main Spindle, Design of Columns and Beds, Acceptance Testing, Determination of M/C Tool Specifications For a Given Spectrum of Products.

MDP 571 Sensors and Transducers (1)

Variable Resistance Transducers, Carbon Resistor Gauge, Bonded Wire Strain Gauges, Variable Inductance Transducers, Differential Inductive Pickups, Linear Variable Differential Transducers (LVDT), Variable Captive Transducers, Piezoelectric Transducers, Electric Magnetic Energy Transducers.

MDP 572 Measuring Equipment

Classification of Measuring Equipment: Instruments, Devices, Machines, and Others. Elements Of an Instrument, Principles of Instruments Design, Design Consideration of Measuring Equipment: Alignment, Rigidity, Amplifications, Precision, Adjustment. Performance Characteristics of Measuring Equipment: Static and Dynamic.

MDP 573 Dimensional Metrology

Length Measurement, Angle Measurement, Geometrical Measurement, Thread and Spiral Measurements, Gear Measurements: Spur, Helical, Bevel and Worm. Cam Measurement, Geometrical Error Measurement, Roundness, Straightness, Flatness, Parallelism, Squareness, Location, Alignment, Surface Texture Measurement, Applications.

MDP 574 Physical Quantity Measurements (1)

Theory of Measurement and Standards, Sensors and Transducers, Force and Torque Measurements, Strain Measurement, Speed and Acceleration Measurements, Pressure Measurements, Level and Quantity Measurements, Temperature Measurement, Others.

MDP 575 Information Theory

Information Systems, Data and Information, Data Bases (Design, Formulation, Manipulation), Methods of Correction for Interfering and Modifying Inputs.

MDP 576 Data Acquisition Systems

Monitoring of Processes and Operations, Experimental Engineering Analysis, Analog and Digital Modes of Operations, Analog to Digital and Digital to Analog Converters, Manipulation, Transmission and Recording of Data, Sensors and Transducers, Engineering Data Acquisition and Processing Systems, Modular System Emphasizing Analog Signal Processing, Compact Data Loggers, System Based Computerized Data System.

MDP 578 Advanced Techniques in Measurements (1)

Linear Measurement Using Laser, Form Measurement Using Laser, Holographic Techniques, 3D Measurement, Image Processing, Inspection Using Computers.

MDP 580 Industrial Organization

Engineering Process, The Product Life Cycle, Product Research Function, Product Design Function, Production or Construction Function, Product Use and Logistic Support Function, Organization and Product Life Cycle, Related Functions and Interfaces, Engineering and Environment.

MDP 581 Facility Planning and Design

Types of Production Systems in Manufacturing and Service Industries, Characteristics of Different Types of Facility Layouts, Layout Objectives, Quantitative and Qualitative Techniques for Solving The Layout Problem, Quadratic Assignment Problem, Application of Computers, Location Theory, Site Selection, Evaluation Techniques, New Trends for Layouts, Materials Handling Equipment and Systems.

MDP 582 Work Study

Productivity, Work and Work Content, Techniques of Work Study, Method Study, Work Measurements, The Standard Time, Application of Learning Curves, Design of Incentive Schemes, Work Place Design and Human Factors.

MDP 583 Basics of Industrial Engineering

The Industrial Engineering Profession, Organization and Administration of Industrial Engineering, Improving The Effectiveness of Industrial Engineering Practice, Productivity: an Overview, Productivity Measurement and Improvement, Creative Problem Solving.

MDP 584 Operations Research

Operations Research and The Art of Problem Solving, Linear Programming and Transportation Model, Linear Programming and Networks, Game Theory, Project Scheduling Using PERT and CPM, Queuing Theory.

MDP 585 Production Planning and Control (1)

The Control Function, Scope of Production Control, Charting, Forecasting, Capacity Planning, Scheduling, Sequencing, Line Balancing, Dispatching and Loading, Materials Control, Categories of Production Control.

MDP 586 Engineering Economics

Principles of Costing, Time Value of Money, Cash Flow and Its Relations, Evaluation of Alternatives, Internal Rate of Return, Depreciation, Replacement, Economic Analysis of Projects.

MDP 587 Quantitative Approaches to Management

Introduction, Cost Volume Profit Analysis, Probability Concepts and Applications, Decision Making Under Certainty, Decision Making Under Uncertainty, Inventory and Production Models, Linear Programming Models, Games Theory and Strategies, Markov Analysis, Waiting Lines.

MDP 588 Maintenance Management

Major Types of Maintenance, Economics of Maintenance Operations, Design of Preventive Maintenance (PM) Programs, on Conditions Maintenance, Man Power Calculation for Maintenance Programs, Planning for Overhauls, Lubrication, Shutdown Planning, Maintenance Organization, Maintenance Information Systems.

MDP 589 Marketing

Types of Market, Product Policy, Product Life Cycle, Pricing, Demand, Promotion and Advertising, Strategic Planning, Market Studies, Distribution and Transportation.

MDP 590 Process Quality Control

The Seven Basic Quality Tools (Histogram, Pareto Chart, Cause and Effect Diagram, Run Charts, Scatter Diagram, Flow Chart, Control Charts), The New Seven Quality Tools (The Affinity Diagram, Relations Diagram, Systematic (Tree) Diagram, Matrix Diagram, Matrix Data Analysis, Process Decision Program Charts (PDPC), and Arrow Diagram), Other Tools (Brainstorming, Check Sheet).

MDP 591 Sampling Inspection

General Introduction, Acceptance Sampling By Attributes, Acceptance Sampling By Variables, Rectifying Inspection, Sampling Plans for Continuous Production, International Standards for Sampling Inspection.

MDP 592 Control Charts

The General Theory of Control Charts, Types of Control Charts, Control Charts for Fraction Defective, Control Charts for Number of Defects, Control Charts By Variables, Cumulative Sum Control Charts, Special Technical Procedures.

MDP 593 Industrial Statistics (1)

Introduction, Empirical Distributions and Descriptive Measures, Probability Theory, Discrete Distributions, Continuous Distributions, Other Statistics, Hypothesis Testing, Analysis of Variance, Analysis of Covariance, Correlation and Regression.

MDP 594 Environmental Quality Characteristics

Elements of The Environment, Water Pollution, Ground Water Pollution, Bacterial and Parasite Pollution, Marine Pollution, Agricultural Pollution, Human Waste Pollution, Industrial Pollution, Air Pollution (Sources and Effects), Impact and Control, Prevention At

Source, Noise Pollution (Sources, Effects, and Control), Survey of Environmental Problems in Egypt and The Surrounding Region.

MDP 595 Legislation and Standardization for Quality

Scope and Objectives, Standardization and Simplification, Standard Space (Vermin Space), Legal Responsibility of Production Companies and Relations with Customers, Legal Aspects in Quality.

MDP 596 Total Quality Control

Total Quality Control: Definition, Purpose, Evaluation and Role in The Modern Business Management. Basic Factors in Controlling Quality and The Jobs of Quality Control, Systems Approach, Establishing The Quality System, Achieving Total Commitment to Quality, Applying Total Quality Control in The Company, Controlling The New Design, Incoming Material Control, Product Control and Special Process Studies, Quality Circles.

MDP 597 Environmental Quality Assessment

Sampling Inspection Techniques and Analysis, Data Requirements for Pollution Control, Archiving Data, Importance of Flow of The Measurement Process, Data Handling and Presentation, Assessment of Quality Models, Describing Uncertainty, Hypothesis Testing, Simple Linear Regression Models, Multiple Linear Regression Models, Problems of Industrial Auditing in Egypt and Their Solutions, Examples of Auditing Industrial Plants.

MDP 598 Quality Systems

Quality System Concept, Quality System Elements, Quality Systems Benefits, Quality Management Role, Training on Quality Systems, Quality Systems Documentation, Internal Auditing, Monitoring Operational Non-Conformities, Purchasing and Supplier Monitoring, Customer Monitoring, Corrective Action Process, Management Review, Changing a Quality System, Quality Systems Examples: ISO 9000.

MDP 599 Design of Experiments (1)

Simple Comparative Experiments, Experiments with Single Factor (The Analysis of Variance), Randomized Block, Latin Squares, Factorial Design (Two and Three Level Factorial Designs).

MDP 600 Mechanical Vibrations (1)

Free Vibrations of Single Degree of Freedom Systems, Forced Vibrations of Single Degree of Freedom Systems Under Periodic Excitation, Forced Vibrations of Single Degree of Freedom Systems Under Non-Periodic Excitation, Free and Forced Vibrations of Two Degrees of Freedom Systems, Free and Forced Vibrations of Multi Degrees of Freedom Systems, Characteristics of Modal Vectors, Solution of The Eigenvalue Problem.

MDP 601 Selected Topics in Quality

The Student Studies One of The Advanced Topics in Quality for Manufacturing and Services Industries.

MDP 602 Mechanisms

Kinematics of Mechanisms: Analysis of Displacement, Velocity and Acceleration. Graphical Synthesis Methods, Linear Analysis Synthesis Methods, Kinematics Synthesis of Mechanisms, Curvature Theory, Introduction to Dynamics of Mechanisms.

MDP 604 Advanced Acoustics

Derivation and Solution of The Wave Equation in 1D, Helmholtz Equation, Elements of Acoustics (Pressure, Velocity, Energy, Intensity, and Acoustic Impedance), The Wave Equation in 3D, Source Strength and Intensity Vector, Sound Power, Eigen Values and Eigen Functions Inside an Enclosure, Diffuse Field, Energy Density, Absorption Coefficient, Sabine Equation, Direct and Reverberant Fields, Room Acoustics, Sound Propagation From Surface Vibration.

MDP 605 Noise and Vibration Control

Introduction to Acoustics, Sources and Measures of Noise and Source Location, Sound Absorbing, Measurement and Application of Sound Intensity, Sound Propagation, Sound Control in Enclosed Spaces and in Ducts, Fundamentals of Vibration, Sources of Mechanical Vibrations, Mobility and Impedance Methods, Vibration Isolation, Vibration Damping, Vibration Absorbers.

MDP 606 Advanced Manufacturing Technology

Introduction to Non Conventional Machining Processes, Energy Utilization, Mechanical Processes: Ultrasonic Machining, Ultrasonic-Aided Machining, Abrasive Jet Machining, Water Jet Machining. Electrical Processes: Electrochemical Machining, Electrochemical Grinding, Electrochemical Discharge Grinding, Electrochemical Deburring, Electrochemical Honing. Thermal Processes: Electron Beam Machining, Laser Machining, Electric Discharge Machining, Wire Cutting, Electric Discharge Grinding, Plasma Beam Machining, Thermal Deburring. Chemical Processes: Chemical Etching, Chemical Discharge Machining. Combined and Hybrid Non Conventional Machining Processes, Rapid Prototyping.

MDP 607 Advanced Machine Design

Introduction and Basic Design Considerations, Stress, Deflection and Strength of Materials Considerations, Mechanical Components Design and Selection: Springs, Shafts, Rolling and Journal Bearings, Gears, Flexible Elements, etc., Using The Reversed Engineering Approach for The Design of Mechanical Components, Using The 2D, 3D Scan CAD/CAM Systems for Design and Manufacturing, Programming Applications, Computer Applications.

MDP 610 Advanced Metallurgy

Imperfection in Crystalline Solids, Dislocations and Deformation Models, Alloy Phase Diagrams and Principles, Diffusion and Phase Transformation, Solidification of Metals, Hardening of Metals and Alloys, Annealing, Structure Properties Relationship, Advanced Metallurgical Processing.

MDP 611 Mechanical Metallurgy

Classification of Metals, Types of Loads, Behavior Under Dynamic Loads (Impact), Mechanical Testing of Metals, Hardness of Metals, Non Destructive Testing of Metals.

MDP 612 Metallurgical Processes

Introduction, Types of Metallurgical Processes, Solidification Processes, Diffusion Processes, Powder Metallurgy, Composites, Case Studies.

MDP 613 Composites and Advanced Materials

Principles of Composite Materials, Types of Matrices and Dispersed Phase, Interfaces Between Matrices and Dispersed Phase, Principles of Properties Tailoring, Theory of The Rule of Mixtures, Polymer Matrix Composites, Ceramic Matrix Composites, Nano-Crystalline, Semiconductors.

MDP 614 Materials Engineering of Polymers

Structure of Polymers (Including Molecular Structure, Amorphos and Semi-Crystalline Polymers, Thermoplastics, Thermosets and Cross-Linked Elastomers), Polymer Additives, Viscoelastic Behavior of Polymers, Rheology of Polymer Melts, Solidification Behavior, Thermal, Electrical, Optical and Mechanical Properties, Permeability and Acoustic Properties.

MDP 620 Fundamentals of Solidification

Kinetics and Heat Transfer, Developing of Structure: Cells, Dendrites, Eutectic and Peritectic, Solute Redistribution, Inclusions and Second Phase, Gas Porosity, Shrinkage Behavior.

MDP 621 Structure and Properties

Types of Macro and Micro Structures, Factors Affecting Structure, Structure Defects, Cast Structures, Weld Structures, Heat Treated Structures, Structure Property Relationships, Design and Tailoring of Structures.

MDP 622 Simulation of Casting and Welding

Solidification Modeling, Numerical Simulation, Heat and Fluid Flow in Casting and Weld Pools, Structure Modeling, Case Studies.

MDP 640 Modern Control Systems

Definition of State, State Variables, State Space and State Trajectories, State Space Representation of Physical System, Jordan Forms, Canonical Forms and Symmetrical Transformation, Determination of The Transition Matrix, Relation with The Classical Methods, Relation Between State Space Representation and The Transfer Function, Controllability and Observability Matrices, Pole Placement Design of Acs Control Systems Using State Space Trajectories, Stability of Nonlinear Control Systems Using State Space Trajectories, Harmonic Linearization, Stochastic Linearization, Stability of Nonlinear Systems.

MDP 641 Optimum Control

Introduction to Optimum Control, Important Control Criteria: The Minimum Time Criterion, The Linear Regulator Problem, The Tracking Problem. Extrema, The Variational Methods (Euler Equation). Design of State Observers, Closed Loop Control with Observer, The Principle of Optimality and Hamilton, Jacob Equation Matrix, Recatti Equation and Its Solution, Design of Optimum Systems with Wiener Filter, and Kalman Filter, The Maximum Pontyriagin Principle. Introducing The Following Optimal Control Problems, Continuous

Time Case, Stabilizing Control, Covariance Upper Bound Control, Linear Quadratic Regulator, L Infinity Control, H Infinity Control LQR (H2).

MDP 642 System Identification

Introduction to System Identification, Frequency and Time Domains for System Identification, Engineering Methods for System Identification, Wiener and Kalman Filters for System Identification, Introduction to MIMO-Systems, Decoupling in MIMO-Systems, Pole Assignment Using State Feedback, Pole Assignment Using Full Rank Controllers, Design of MIMO Systems Using The Inverse Nyquist Array and Mac Farlines's Characteristic Locus Method, Smoothing Filtration and Forecasting of Signal Processes, Auto Regressive Models for SISO- and MIMO-Systems, Stochastic Analysis of Control Systems Using Correlation and Spectral Methods.

MDP 643 Advanced Techniques in Automatic Control

Design of Logic Control Systems Using Petri Nets, Different Types of Petri Nets and Their Characteristics With Industrial Examples, Using Grafcet Method for The Design of LCS, Comparison of Petri Nets and Grafcet Techniques with Practical Examples Using Neural Networks for The Design of ACS, The Learning Techniques in Neural Networks, Applications of The Neural Controllers in The ACS, Comparison of The Neural Network Approach with The Classical and State Space Design Methods, The Fuzzy Logic Control Engineering, Introduction to Real Time Control Systems, Introduction to Non Holonemic Control Problems.

MDP 644 Digital Control (2)

Design of Digital Controllers, Hardware of Digital Controllers, Programming of Digital Controllers, Programming of Microcontroller- Based Controllers, Systems of Digital Control Units, Numerical Control Heads in Production Lines, Design of Production Lines Using General Purpose Digital Control Heads, Multi Axis Digital Control Heads, Applications in CNC Machines and in The Assembly Lines of Electronic Boards.

MDP 645 Mechatronics (2)

Introduction to The Advanced Topics of Mechatronic Control System, Design of Mechatronic Based on The Microcontroller (What Is The Microcontroller), Advantages of The Micro-Controller, Structure of The Microcontroller. Interfacing of The Microcontroller to a Mechatronic System in Different Areas: Design of Electromagnetic Bearings, Design of Data Acquisition System, Modeling and Identification of Mechanical Vibration System, Design of Mechatronic System for Supervision of Manufacturing System.

MDP 646 Adaptive Control

Concept of Adaptive Control for Unpredictable Variable Parameter Systems, Types of Adaptive Control Systems, Self Adjusting System, Model Reference Adaptive Control, Design Methods of Adaptive Controller, Sliding Mode and Its Applications, Variable Structure Systems Design and Analysis, The Dual Control Concept With Applications, Analysis of Adaptive Systems As Nonlinear Systems.

MDP 647 Pneumatic and Hydraulic Control (2)

Fluid-Tronic: Electro-Pneumatic System, Electro-Hydraulic System, Solenoids, Coils, Motors. Hydraulic and Pneumatic Proportional Valves: Directional Proportional Valves,

Pressure Proportional Valves, Flow Proportional Valves. Hydraulic and Pneumatic Servo System: Directional Servo Valves, Pressure Servo Valves. Pneumatic Controller: Types, Dynamic Performance, Tuning. Design of Pneumatic and Hydraulic Circuits: Grafset, Pertinent and State Diagram, Industrial Applications.

MDP 650 Metal Forming Tools and Accessories (2)

Introduction, Design of Shearing Dies: Single, Compound, Combination and Progressive Dies. Design of Bending Dies: Spring-Back Angle, Minimum Bend Analysis. Design of Deep Drawing Dies: Cylindrical, Rectangular, Conical Shape Cups.

MDP 651 Simulation of Metal Forming Processes

Simulation of Different Metal Forming Processes in Laboratory Level As Compared to Actual Metal Forming Processes to Indicate The Conditions of Metal Forming Processes, Stages, Developed Stresses and Strains, The Structure and Mechanical Behavior of Deformed Metals, Extrusion, Wire Drawing, Tube Drawing, Deep Drawing, etc.

MDP 652 Theory of Plasticity

State of Stress, State of Strain and Strain Rates, Stress/Strain and Stress/Strain Rate Laws, Yield Criteria and Flow Rules, Plastic Stress/Strain Relationship, Slip Line Field Technique, Load Bounding Techniques, Visio-Plasticity, Numerical Methods.

MDP 653 Mathematical Modeling of Metal Forming Processes

Numerical Analysis, Bases of Finite Elements, Application of Finite Element Methods to Different Metal Forming Processes Such As Forging, Rolling, Extrusion, Wire Drawing, Tube Drawing, Deep Drawing, High Energy Rate Forming, Explosive Forming, Electro Hydraulic Forming, Electromagnetic Forming, Super-Plastic Forming, Rubber Pad Forming, etc.

MDP 654 Advanced Metal Forming

Development in Metal Forming, New Metal Forming Processes, Analysis of Methods of Operation, Calculations of Load and Power, Parameters Affecting Processes, Methods of Verification, Limitations, Advantages and Disadvantages of The Processes Applications.

MDP 657 Computer Applications in Industry

Scopes of Utilization of Computer Industry, Expert Systems in CAM, Integration Between CAD and CAM, Data Bases Needed for Manufacturing, Computer Applications: CNC, Process Planning, Group Technology, PLC, Rapid Prototyping.

MDP 658 Computer Aided Process Planning

Variant and Generative Approach, Graph Theory, Knowledge Base System for Equipment Selection, Feature Recognition and Extraction, Expert Systems, Phases of Process Planning, Machining Optimization, Precedence Constraints, Precedence Matrix, Tool Accessibility.

MDP 659 Design for X

Concurrent Engineering, Rules, Guidelines, and Methodologies Along The Product Life Cycle, Development Phase, Production Phase, Utilization Phase, Disposable Phase, Design to

Cost, Design to Standard, Design for Manufacturing, Design for Assembly, Design for Inspection.

MDP 660 CNC Machine Tools (2)

Numerical Control of Machine Tools, Interpolators, Processors in CNC Machine Tools, Sensors and Transducers in CNC, Actuators in CNC, Drives (DC, AC, and Digital), Mechanical Parts in CNC, Types of Control Units: Fanuc, Siemens, Hiedenhien, etc.

MDP 661 Flexible Production Systems

Conventional Production Systems, Mass Production Systems, Group Technology, Flexible Manufacturing Systems, Languages for Computer Applications in Production Systems, CAD/CAM Systems.

MDP 662 Advanced Programming Methods of CNC Machine Tools

Programming Methods, Computer Aided CNC Programming, Bases of Computer Aided Part Programming APT, Commercial Packages, Designing Methods of a Programming Package, Data Bases, CAD/CAM Software Integration, Conversational Programming.

MDP 664 Theory of Metal Cutting (2)

Effect of Workpiece and Tool Materials on The Machining Process, Role of Friction (Real and Apparent Contact Areas Between Chip and Tool Faces), a Mechanistic Model of The Cutting Process, Prediction of The Cutting Forces and The Cutting Temperature, Machinability: Definition, Criteria, Applications, Methods of Improvement. Hot Machining (Effect on Cutting Forces, Tool Life and Cost)

MDP 665 Manual CNC Part Programming

Cutting Conditions for CNC Machines, G Codes Systems, Codes and Format, Data Programming (Positioning, Linear, Circular, Loops, Canned Cycles, Subroutines).

MDP 666 Machine Tools (2)

Requirements of Machine Tools, Machine Tool Structures, Cross Sections and Materials of Structural Elements, Design Criteria of Structural Elements (Strength, Stiffness, Minimum Weight), Selection of The Proper Shape of Cross Section, Static Performance of Machine Tool Structures, Static Force Analysis On: Lathe, Drilling and Horizontal Milling Machines. The Static Loading Test of Machine Tools, Analysis of The Static Deflections, Dynamic Performance of Machine Tool Structures, The Dynamic Loading Test (Harmonic, Impact Excitation), Dynamic Stability of Machine Tools, Chatter, Chatter Testing.

MDP 669 Intelligent Visual Inspection

Intelligent Manufacturing, Biological Vision Systems, Artificial Neural Networks, Image Acquisition and Storage, Low and Intermediate Level Processing, Computational Approach to Artificial Vision, Automated Visual Inspection Systems.

MDP 670 Theory of Measurement

Standards of Measurements (International, National, Secondary, and End Standards), Factors Affecting Accuracy, Theory of Errors, Classifications of Measuring Techniques (Direct and

Indirect, Absolute and Relative, Contact and Contactless, Element and Composite Methods), Statistical Analysis of Measured Results.

MDP 671 Sensors and Transducers (2)

Variable Resistance Transducers, Variable Inductance Transducers, Variable Capacitance Transducers, Piezoelectric Transducers, Electromagnetic Energy Transducers, Photoelectric Transducers, Thermoelectric Transducers, Other Transducers.

MDP 672 Geometrical Error Measurement

Theory of Linear Measurement and Standards, Geometrical Measurement: Analytical Analysis and Applications. Surface Texture Measurement: Using Optical, Stylus and Other Techniques.

MDP 674 Physical Quantity Measurements (2)

Sensors for Static Quantity, Measurement of High Strain Rates, Equipment Used for The Measurements of Pressure Flow, Levels and Temperature, Applications on The Design Principles of Measuring Equipment.

MDP 675 Advanced Techniques in Measurements (2)

Theory of Laser Measurements, Holographic Techniques, Destructive and Non-Destructive Tests, Ultra Sonic Measurements, Applications of 3D Measurement, Using Computers and Image Processing Techniques, Using Lasers, Using 3D Measuring Machines.

MDP 676 Calibration

Technical Bases of Calibration, Standard Calibration Methods, Maintenance Plan for Measuring Equipment, Calibration Procedures, Calibration of Equipment For: Linear Measurements, Angular Measurements, Roughness Measurements, Sensors. Analysis of Calibration Results.

MDP 677 Computer Applications in Measurements

Monitoring of Measuring Operations, Analog and Digital Modes of Measurements, Data Base, Data Entry and Storage, Analog to Digital Converter and Vice Versa, Applications, Roughness, Flatness, Roundness and Straightness, 3D CMM, Interfaces Between Instruments and Computer, Others.

MDP 678 Machine Tools Acceptance Tests

Measuring Equipment Used with Tests, Standard Tests, Geometrical Tests (For Lathes, Milling, Drills, and Shapers), Performance Tests for Bearings, Static Tests, Measurement of Power and Efficiency.

MDP 680 Product Safety Management and Engineering (2)

Product Liability, Safety Costs and Losses, Regulatory Agencies and Statute Laws, Standard Criteria, Modern Concepts of Accident Prevention, Hazardous Characteristics of Product, Malfunctions, Operator Error, Minimizing Probability of Accidents and Their Effects, Product Safety Programs, Detailed Analysis of The Product, Operating Hazards Analysis, Fault Tree Analysis, Risk Assessment, Manufacturing The Safe Product.

MDP 681 Production Planning and Control (2)

Introduction to Production and Operations Management. Productivity, Quality and Cost. Concepts of Decision Making, Information Systems, Forecasting and Time Series, Project Planning and Management, Product Design and Development, Resource Requirement Planning, Facility Location and Distribution System Design, Process Analysis, Process Design and Facility Layout, Job Design and Work Measurement, Inventory Policy, Aggregate Production Planning and Master Scheduling, Materials Requirement Planning, Operations Scheduling and Production Control, Material Management, Quality Control.

MDP 682 Materials Management

Fundamentals of Purchasing, Purchasing Techniques and Procedures, Warehouse Operations, Warehouse Controls and Procedures, Material Analysis, Material Control, Warehousing Safety and Security, Warehousing Planning and Material Handling, Stocktaking and Stock Checking.

MDP 683 Simulation Modeling

Definitions and Basic Concepts, Queuing Models As The Basis for Simulation, Monte Carlo Simulation, Input Data Analysis Using Statistical Distributions, Simulation Languages, Model Validation and Verification, Design of Simulation Experimentation, Practical Case Studies.

MDP 684 Modeling and Optimization

Fundamentals of Modeling, Systems Investigation, Model Translation, Design of Computer Simulation Experiments, Validation and Analysis, Measurement Aspects in Modeling, Fundamentals of Optimization, Optimization Conditions, Unconstrained Methods, Linear Constraints, Non Linear Constraints, Optimization Techniques, Integer Programming, Dynamic Programming, Non Linear Programming, Algorithms and Heuristics, Application to Assembly Line Balancing, Inventory Control.

MDP 685 Human Factors Engineering “Ergonomics”

Systems, Research Methodologies, Information Input, Human Output and Control, Work Place Design, Environmental Design, Human Factors Applications.

MDP 686 Production and Environment

Aspects of Environmental Crisis, Main Concepts, Concepts Related to Responses to The Environmental Crisis, Classification of Renewable Resources and Their Applications, Principles Associated with Matching of Ecology and Economy.

MDP 690 Design of Experiments (2)

Statistical Concepts, Experiments of Evaluation, Experiments of Comparison, Randomized Blocks, Latin Squares and Related Designs, Factorial and Fractional Factorial Experiments, Correlation and Regression Analysis, Non Parametric Experiments, Taguchi's Contributions to Experimental Design.

MDP 691 Reliability Engineering

Concepts, Terms and Definitions, Basic Reliability Models (The Failure Distribution, Constant Failure Rate Model, Time Dependent Failure Model), Reliability of Systems, State-

Dependent Systems, Physical Reliability Models, Design for Reliability, Design for Maintainability, Analysis of Failure Data, Reliability Testing.

MDP 692 Quality Engineering

The Technological Triangle, Quality Engineering Technology, The Techniques of Quality Engineering, Quality Objectives and Quality Policy, Quality and Income, Quality Costs, Quality Planning, Organization, Vendor Relations, Marketing of Quality, Quality Improvement, Motivation, Production of Quality, New Product Quality, Manufacturing Quality.

MDP 693 Quality Control of Service Industries

Industrialization of Services, The Nature and Classification of Service Industries, Service Characteristics, Service Technology, Designing The Service System, Utilization of Service Capacity. Planning, Scheduling, and Controlling Service Activities. Measuring and Controlling Service Quality, Management Information Systems: The Nervous System of Service Organization, Service Quality Costs, Service Quality Assurance.

MDP 694 Industrial Statistics (2)

Presentation and Description of Data, Principles of Probability, Discrete Probability Distributions, Continuous Distribution, Functions, Sampling Distributions, Statistical Inference, Regression and Correlation Analysis.

MDP 695 Statistical Quality Control (2)

Quality Definitions and Concepts, Process Capability Analysis, Theory of Control Charts, Statistical Control Charts for Attributes, Statistical Control Charts for Variables, Acceptance Sampling: Principles and Concepts, Acceptance Sampling By Attributes, Acceptance Sampling By Variables, Elements of Reliability Analysis.

MDP 696 Quality Information Systems

Planning The System, Accuracy and Precision, Recording Forms, Use of Charts, Storage and Retrieval of Data, Electronic Data Processing, Computer Software.

MDP 697 Personnel Management

Job Analysis and Design, Determining The Demand and Supply Factors of The Labor Force, Development of On-Job-Training Schemes, Hierarchical Structure, Incentives Mechanisms, Job Appraisal Techniques, Career Planning Development.

MDP 698 Consumer Behavior Analysis

Consumer Behavior and Marketing Strategies, Cross Culture Variations in Consumer Behavior, Group Influences on Consumer Behavior: Learning, Memory and Product Positioning, Motivation, Personality and Emotion, Attitudes and Influencing Attitudes, Consumer Decision Process and Problem Recognition, Post-Purchase Processes, Customer Satisfaction and Commitment, Organizational Consumer Behavior.

MDP 699 Total Quality Management

Principles of Quality Management, Total Quality Management Philosophy, Quality Planning, TQM Organization, TQM Tools, TQM Success Factors, Customer Orientation, Continuous

Improvement Strategies, Preventive Techniques, Human Dimensions of TQM, Team Development, TQM Road Map.

MDP P97 Project

MDP P98 Project (1)

MDP P99 Project (2)

11. Department of Mechanical Power Engineering

MEP 500 Transient Combustion

Mathematical Models of Droplet Vaporization, Fuel Atomizers, The Simple Chemically Reacting System Model (SCRS), Droplet Combustion, Survey of Kinetically Influenced Phenomena. Introduction to Chemical Kinetics, Reaction Rate Formula, Spontaneous Ignition Model, Laminar Flame Propagation, Mathematical Model for Spark Ignition.

MEP 501 Combustion

Combustion Fundamentals, Fuel Characteristics, Atomization of Liquid Fuel. Evaporation and Combustion of Fuel Droplets, Characteristics of Turbulent Diffusion Flames for Liquid, Gaseous and Solid Fuels, Characteristics of Turbulent Premixed Frames, Mechanisms of Pollutants Formation During Combustion, Flame and Combustion Requirements in Industrial Furnaces and Boilers.

MEP 502 Combustion Equipment for Boilers

Combustion Requirements, Methods of Flame Stabilization, Gaseous Fuel Burners, Liquid Fuel Burners, Components of Solid Fuel Burners, Air Supply Systems for Burners, Components of Fuel Supply Lines for Gaseous, Liquid and Solid Fuel Burners, Starting Up Requirements for Burners, Load Control in Burners, Safety Systems for Operation of Burners, Burner Specifications, Selection of Burners for The Operation of Boilers and Industrial Furnaces.

MEP 504 Industrial Furnaces and Boilers

Fire Tube Boilers, Water Tube Boilers, Industrial Furnaces, Thermal Design of Boilers and Furnaces, Standards for Boilers Design and Manufacturing, Testing of Boilers, Boiler and Industrial Furnaces Auxiliaries, Hot Water and Oil Boilers, Waste Heat Boilers.

MEP 506 Steam Equipment and Piping

Steam Equipment for Boilers, Water Feeding Tanks for Industrial Boilers, Water Pumps for Boilers, Water and Steam Valves, Boiler Blow Down Systems, Steam Strainers, Steam Traps, Pressure Reducing Valves, Air Vents and Vacuum Breakers, Equipment to Control Steam Flow Rates, Methods to Measure Steam Flow Rates, Design of Steam Pipe Lines and Networks, Thermal Insulation of Steam Pipe Lines, Types of Steam Pipes, Installation of Steam Pipe Lines, Expansion in Steam Pipe Lines, Methods of Condensation Recovery in Steam Pipe Lines.

MEP 509 Computer Applications in Furnaces and Boilers

Introduction to Computer Applications in The Field of Boilers, Efficiency Calculations of Boilers Given The Fuel Type, Temperature and Composition of Exhaust Gases. Programs for Thermal Design of Boilers, Programs for Design of Steam Piping and Networks, Programs for Control of Boiler Operation, Programs for Calculation of Thermal Losses from Steam Pipe Lines and Determination of The Efficiency of Thermal Insulation.

MEP 510 Pump Design (1)

Revision of Classification and Performance of Different Pump Types, Design of Centrifugal
Pumps: Design of Pump Shaft and Impeller Dimensions, Design of Impeller Vanes, Diffuser Design, Design of Pump Casing.

MEP 511 Pipe Networks and Reservoirs

Symbols for Pipelines and Fittings, Incompressible Flow in Pressure Conduits, Pipeline System Analysis and Design, Pipe Fittings, Pipe Industry and Technology, an Introduction to Transfer of Solids in Piping, Pipeline Insulation. Laying and Protection, Economics of Pipelines and Costing, Water Hammer in Pipelines, Methods of Water Hammer Protection, Computer Programming Aids. Measurements and Telemetry, Standard Specifications.

MEP 512 Operation, Maintenance and Testing of Pumps

Pumps Classification and Range of Application. Pumps Sealing and The Mechanical Seals with The Theory of Operation, Types of Impeller Rotors, Pump Materials Used for The Construction of Different Pump Components with The Standard Specifications, Starting and Stopping Procedures for Pumps with Low Specific Speeds, Daily, Semi Annual, and Annual Inspection and Maintenance of Different Types of Pumps, Pump Troubles and Ways of Maintenance and Repair. Pump Testing, Tabling of Results and Improving The Performance.

MEP 513 Pump Selection

Rotodynamic Pump Types, Displacement Pump Types. Owner's Philosophy, Manufacture's Philosophy, Consulting Engineer Philosophy, Number of Pumping Units, Suction Conditions, Discharge Conditions, Specifications, Prime Movers, Accessories, Maintenance and Operating Economics, Pump Data Sheets, Pump Drawings, Evaluation of Bids.

MEP 515 Pumping Stations

Pump Classifications, Pump Selection, Pump Prime Movers, Water Pumping, Waste Water Pumping, Measurement Instruments and Control, Vibrations and Noise. Design for Easy Operation and Maintenance, Basic Design Considerations, Station Site, Contract Documents, Station Economics.

MEP 516 Pump Design (2)

Airfoil Theory for Propeller Pump Design, Design of Axial Flow Pumps, Design of Different Types of Positive Pumps.

MEP 517 Corrosion Engineering

Theory of Corrosion: Nature of Metals, Electrolytes, Corrosion Mechanism, Polarization, Passivity. Forms of Corrosion: Bi-Metallic Corrosion, Differential Concentration Corrosion. Erosion Corrosion, Stray Current Corrosion. Theory of Corrosion Prevention: Coating Inhibitors, Cathodic Protection, Anodic Protection. Corrosion Survey and Monitoring, Design of Protection Systems.

MEP 518 Pumping Services

Introduction, Water Supply, Drainage and Irrigation, Fire Pumps, Steam Power Plants, Chemical Industries, Petroleum Industries, Pulp and Paper Mills, Food and Beverages, Mining, Marine, Hydraulic Presses, Refrigeration, Heating and Air Conditioning, Pumped Energy Storage, Nuclear Power Plants, Solid Pumping.

MEP 519 Computer Applications in Pumping

Design Algorithms, Flow Calculations Inside Pump Passages, Matching between The Pump and The Motor, Trouble Shootings, Pump Graphics and Stress Analysis Using Computer Software, Computer Performance Analysis for Pumps.

MEP 520 Performance of Industrial Thermal Units

Fire Tube Boilers: Different Designs of Fire Tube Boilers, Accessories, Control and Measurement Devices, Performance of Fire Tube Boilers, Protection Systems, Water Tube Boilers: Different Types of Water Tube Boilers, Control and Measurements Devices, Attemperators, Protection Systems, Performance of Water Tube Boilers, Deaerators: Deaerator Types, Control Systems, Protection Systems, Performance of Deaerators, Heat Exchangers: Types of Heat Exchangers, Temperature Control Systems, Steam Traps, Performance of Heat Exchangers, Cooling Towers: Types of Cooling Towers, Applications, Performance of Cooling Towers.

MEP 521 Aerodynamics (1)

Temperature Variation with Altitude, Pressure and Density Variation with Altitude, Viscosity Variation with Altitude, Body Pressure Distribution for a Perfect and Real Fluid, General Force and Moment Equations, Principal Aerodynamic Forces and Moments, Aircraft Types, Airplane Components, Airfoils and Wings, Other Different Airplane Components.

MEP 522 Gas Dynamics (1)

Steady Flow Energy Equation, Euler's Equation, Speed of Sound and Mack Number. Flow with Friction, Equation of Flow with Friction, The Area-Velocity Relationship, Flow in a Constant-Area Duct. The Shock Wave, The Normal Shock Relation for The Perfect Gas, Equation for Flow with Combined Area Change, Friction and Heat Transfer, The General Heat Transfer Case, with Area Change Without Friction, Heat Transfer in a Constant Area Duct Without Friction, The Rayleigh Curve.

MEP 523 Water Turbines

Fundamental Concepts of Fluid Mechanics and Water Turbines: Historical Review, Characteristic Specific Speed, Classifications, and Configurations of Turbines. Impulse Turbines: Setting, Head Balance, Speed Regulations, Design Considerations, Energy Conversion, Performance and Testing. Reaction Turbines: Classifications Inward/Outward Flow Turbines, Francis Turbines, Deriaz Turbines, Design Considerations, Tailpipes, Energy Conversion Performance and Testing. Power House: Requirements and Site Selection, Layout, Number and Size of Units, Underground Power House, Hydro-Generators, Gates and Valves, Electrical Equipment, Auxiliary Equipment.

HEP 524 Gas and Steam Turbines

Gas Turbines: Gas Turbine Cycles, Radial Flow Turbines, Axial Flow Turbines, Component Matching. Steam Turbines: Steam Turbine Cycles, Basic Types and Elements of Steam Turbines. One Dimensional Flow through Axial Stages, Theory of Twisted Blades.

MEP 525 Pumps and Compressors

Pumps Performance: Velocity Diagrams, Losses, Specific Speed, Cavitation, Water Hammer, Axial Thrust and Stresses. Design of Radial Type Centrifugal Pumps: Impeller Design, Diffuscr Design, Volute Casing Design. Pump Testing. Compressors :Performance, Compressible Fluid Analysis, The Axial Flow Compressors: The Velocity Triangles, The Thermodynics of Axial Compressor Stage Flow, The Loading Coefficient, The Flow Coefficient, Degree of Reaction, Design of The Axial Flow Compressor Stages: The Aerofoil Theory, Procedure of Axial Flow Compressor Design, Testing of Compressors.

MEP 526 Control of Pumps and Turbo-Machines

Basic Definitions of Control Systems, Mathematical Representation of Physical Systems, Transient Response of Control Systems, Laplace Transformation, Application of Hydraulic Governors in Thermal Systems, Types of Controllers (Pneumatic, Hydraulic). Frequency Response Methods in Control Systems: Bode Plots, Polar Plots, Nicholas Chart. System Stability, Compensation Techniques.

MEP 528 Operation, Maintenance and Testing of Turbo-Machines

Classification of Turbo-Machines and Range of Application for Each. Pump Theory and Performance, Pump Sealing and The Mechanical Seals with The Theory of Operation. Pump Shafts and Its Load Calculations, Materials Used in Construction of Pump Elements and Its Standard Specifications. Daily, Semiannual and Annual Inspection for The Different Pump Types, Starting and Stopping Procedures, Pump Troubles and Testing Procedures. Theory of Operation of Fans, Blowers and Compressors. Optimum Operation of Pumps and Compressors and Performance Monitoring. Testing of Fans Blowers and Compressors and Means of Performance Enhancement. Gas Turbine Power Stations: Principles of Operation, Turbines Selection, Auxiliary Accessories, Installation of Turbines, Accidental Troubles.

MEP 529 Fluid Mechanics (1)

Kinematics of Fluid Motion, Flow of Incompressible Ideal Fluids, Flow of Compressible Ideal Fluids, Impulse Momentum Principle, Similitude and Dimensional Analysis, Fluid Flow in Pipes, Fluid Flow Around Immersed Bodes, Troubles of Unsteady Flows, Fluid Measurements.

MEP 530 Heat Transfer (1)

The Differential Equation of Heat Conduction, The Steady State Heat Conduction in Two and Three Dimensions: Analytical and Numerical Methods. Fins with Variable Cross Section. The Transient Heat

Conduction in One and Multi Dimensions for Sudden Change of The Surface or The Surrounding Fluid Temperatures By Mathematical, Heisler Charts and Graphical Methods, Lumped System Analysis.

MEP 531 Hot and Cold Water Piping Systems

Pressure Drop Equations and Pressure Drop Evaluation, Flow Rate Limitations, Sizing of Hot and Cold Water Piping, Gas, Steam and Fuel Piping, District Heating and Cooling: Design Guide Lines for The Water Distribution Systems, Hydraulic Considerations: Water Hammer, Pressure Losses and Pipe Sizing, Thermal Considerations: Methods of Heat Transfer Analysis and Thermal Insulation, Pipe Supporting and Guides, Anchorage, Distribution System Construction.

MEP 532 Heat Transfer in Industrial Furnaces and Boilers

Fundamentals of Conduction, Convective and Radiant Heat Transfer. Heat Transfer from Gaseous, Liquid and Solid Fuel Flames. Heat Transfer from Flames in Industrial Furnaces, Heat Transfer from Flames and Combustion Products in Fire Tube and Water Tube Boilers. Methods to Control Heat Transfer Rates, Thermal Insulation of Boilers and Industrial Furnaces.

MEP 533 Thermal Drying Processes

The Need for Drying Agricultural Products, Product Requirements of Temperature and Humidity, Detailed Calculations of Solar Irradiation Intensity, Solar Angles Concepts and Governing Equations for Solar Collectors. Possible Designs for Solar Energy Drying and Calculations, Its Thermal Balance, Heat Losses, Efficiency. Other Parameters for Evaluation of Dryers Performance, Other Drying Processes.

MEP 534 Preparing Processes

Definition and Introduction, Preparation Processes: Purification, Separation, Drying, Mixing, Forming. Performance and Matching, Mass and Energy Balance, Cost Estimate.

MEP 536 Heat Transfer (2)

Differential Equation of Heat Conduction, Steady State Heat Conduction in Two and Three Dimensions, Analytical, Numerical and Graphical Methods, Transient One and Multi-Dimensional Heat Transfer for a Sudden Change of Its Surface Temperature or Due to a Sudden Change in The Temperature of The Surrounding Fluid By Analytical, Numerical, Charts, and Graphical Methods. Transient and Periodic Heat Transfer for Lumped Systems. Thermal Radiation and The Radiation Properties, The View Factor, Radiant Heat Exchange between Nonblack Surfaces, Gaseous and Flame Radiation, Radiant Heat Exchange in The Presence of Absorbing, Reflective and Transmitting Media, The Radiant Heat Transfer Coefficient.

MEP 537 Treatment of Boiler and Industrial Water

Chemical and Physical Composition of Water, Methods to Remove Solid Water Suspensions: Methods of Water Purification By Settlement, Construction and Performance of Water Filters, Water Storage, Requirements of Boiler and Industrial Water, Methods to Reduce Dissolved Salts in Water, Control Equipment for Operation of Water Treatment Plants. Internal Treatment of Boiler and Industrial Water, Dearators and Gas Extraction Towers, Selection of Water Treatment Plants to Suit Type of Boilers and Industrial Processes Water Analyzing

MEP 539 Refrigeration Cooling Load (1)

Inside and Outside Operating Conditions, Design Conditions, Heat Transmission By Conduction, Convection and Radiation in Composite Walls, Solar Radiation, Heat Load from The External Envelope and The Ground.

MEP 540 Refrigeration Cooling Load (2)

Air Change Load, Additional Loads: Electrical Motors, Light, People, Product Load: Sensible, Respiration. Equipment Selection.

MEP 541 Testing, Adjusting and Balancing of HVAC Systems

Terminology, General Criteria, Air Flow Measurement Methods- Balancing Procedure for Air Distribution, Variable Air Volume (VAV) Systems, Balancing Hydronic Systems: Principles and Procedures- Methods of

Water–Side Balancing, Fluid Flow Measurements, Steam Distribution, Cooling Towers, Temperature Control Verification, Field Survey for Energy Audit, Testing for Sound and Vibration.

MEP 542 Preservation and Freezing Processes

Commercial Freezing Methods, Precooling of Fruits and Vegetables, Freezing of Fish. Poultry and Meat Products, Cooling and Freezing of Dairy Products, Cooling and Freezing of Bakery Products, Cooling and Freezing of Precooked Foods, Cooling and Freezing of Beverages and Fruit Juice Concentrates, Storage Requirements for Refrigerated Foods.

MEP 543 Cooling and Freezing Systems

Engineering Refrigeration Systems for Industrial and Commercial Practices: Liquid Overfeed Systems -System Practices for Halo-Carbon Refrigerants, System Practices for Ammonia, System Practices for Secondary Refrigerants, System Practices for Multistage Applications, Moisture, Lubricants, and Contaminants Control in Refrigeration Systems.

MEP 544 Control and Safety Equipment in Refrigeration and Air Conditioning

Control Theory and Terminology, Types of Control Devices: Pneumatic, Electric, Electronic and Fluidic Flow Control Devices, Elementary Control Systems, Complete Control Systems. Electric Control Systems- Supervisory Control Systems, Special Control Systems.

MEP 545 Installation and Maintenance of Refrigeration Systems

Introduction, Refrigeration Tools and Materials- Installation and Service of Main Refrigeration and Airconditioning Components: Compressors, Evaporators, Condensers, Cooling Towers, Air Induction Units, Pumps, Air Washers, Air Heaters, Water Coolers, Control and Safety Units- Installing and Servicing Small Hermetic Systems- Industrial and Commercial System Installing and Servicing- Details of The Installation of Pipe Systems: Water, Steam, Air and Refrigerant Piping, Methods of Insulation of Traditional Cold Store Building- Methods of Insulation of Prefabs Cold Store Building.

MEP 546 Refrigeration and Freezing Applications

Refrigerated Warehouse Designs- Refrigerated Warehouse Applications. Freezing Tunnel Types, Design, and Application- Refrigeration Applications in Concrete Dams, Subsurface Soil, and Foundations- Ice Manufacture.

MEP 547 Performance and Economics of Refrigeration

Energy Analysis of Thermal Systems, Engineering Economy Background- Cost Equations, Subsystem Analysis- Selection of Systems Using Cost Equations, Optimization Methods.

MEP 548 Computer Application in Refrigeration

Introduction to Microcomputers, Basic Language, Numerical Analysis and Programming, Applications in Refrigeration and Freezing: Heat Load Calculation, Refrigeration and Freezing Systems in Cooling and Freezing Equipment.

MEP 549 Airconditioning Cooling Load (1)

Introduction, Thermal Storage, and Thermal Capacity of Structures and Enclosures. Sensible and Latent Loads, Weather Data, Outside and Inside Design Conditions, Heat Transmission Coefficients. External Loads: The Cooling Load Temperature Differences, Methods of Calculation of The Conduction Cooling Load from Exterior Walls, Ceilings, Floors, Interior Partitions and Roofs Conduction and Solar Load from Fenestration, Effect of Shading on The External and Solar Loads. The Load from The Structure During The Noncontinuous Operation, The Effect of The Running Time and Timing on The External Loads in Noncontinuous Operation.

MEP 550 Airconditioning Cooling Load (2)

Internal Loads: Occupants, Machinery and Equipment, Electric Motors, Appliances, Lighting, Ventilation and Infiltration Air Cooling Load, Pressurization Air to Prevent Infiltration. Cooling Loads for Residential Buildings. Psychrometric Processes.

MEP 551 Natural and Mechanical Ventilation Systems

Hygienic Aspects of Ventilation, The Goal of Ventilation, Health Industrial Hazards, Dust, High Temperatures and Humidity, Harmful Liquids and Gases, The Natural of Ventilation: The Role of Wind and The Structure Height- The Mechanical Ventilation: Design Principles, Local Ventilation and Isolation of Districts, Ventilation Air Quality, Temperature and Humidity, Fire Precautions in Ventilation Systems, Special Ventilation Application: Air Curtains and Ventilation Protections Against Fire, Ventilation of Hospitals and Clean Rooms, Industrial Ventilation, Control of Thermal Sources and Relaxation of Heat Loads, Concentration Dilution By Ventilation, Local Exhaust Systems, Exhaust Air Quantity, Ventilation Hoods Design and Selection, Air Flow and Distribution Methods, Air Flow in Ducts, Duct System Design and Construction Details, Dust Collection Ducts, Exhaust Fans, Noise Attenuation.

MEP 552 Air Distribution Systems in Air Conditioning

Air Flow and Ducts: Pressure Variation in Ducting Flow, The Friction Pressure Loss in Ducts, The Darcy Equation, The Friction Factor Chart, The Correction Factors, The Dynamic Pressure Loss, The Dynamic Pressure Loss Coefficient, The Additional Equivalent Length, Air Duct Designs: The Design Considerations, Methods of Designs: The Variable Velocity Method, The Equal Friction Method, The Static Pressure Regain Method The Heat Loss or Gain and Ducting Insulation Noise: Noise Sources, Noise Attenuation. Air Diffusion: Principles of Air Diffusion, Air Outlets, Its Locations and Types, Methods of Air Purification, Types of Air Filters, Its Selection and Applications, Air Fans: Fans Types, Fan Laws, Performance Charts, The Inter-Relationship of Fans and Ducts, Selection of Fans, Fan Installation.

MEP 553 Airconditioning Systems

Basics of Airconditioning System Design, All Air Systems, Air and Water Systems, Unitary Systems, Total Energy Systems, Forced Air Systems, Chilled and Dual Temperature Water Systems, Industrial Exhaust Systems.

MEP 555 Installation and Maintenance of Airconditioning Systems

Introduction, Refrigeration and Airconditioning Tools and Materials, Periodical and Preventative Maintenance, Compressors, Evaporators, Control and Safety Devices, Boilers, Chillers, Air Handling Equipment, Room Terminal Units, Pumps, Cooling Towers, Air Cooled Condensers, Evaporative Condensers, Fuel Storage Tanks, Fans and Ventilators ,Hoods, Duct Work, Piping, Insulation, Construction of Building Insulation.

MEP 556 Airconditioning and Ventilation Applications

Introduction, Residences, Retail Facilities, Commercial and Public Buildings, Places of Assembly, Domestic Facilities, Hotels Health Facilities, Surface Transportation, Aircraft, Ships, Industrial Air Conditioning, Enclosed Vehicular Tunnels Facilities, Laboratories, Engine Test Facilities, Printing Plants, Textile Processing, Photographic Materials, Drying and Storing Farm Crops, Airconditioning of Wood and Paper Products Facilities, Mine Airconditioning and Ventilation, Ventilation of The Industrial Environment.

MEP 557 Performance and Economics of Air Conditioning

Energy Analysis of Thermal Systems, Engineering Economy Background, Cost Equations, Subsystems Analysis, Comparison between Systems Using Cost Equations. Optimization Methods.

MEP 558 Computer Applications in Air Conditioning

Introduction to Microcomputers, Basic Language, Numerical Analysis and Programming, Application in Air Conditioning, Heat Load Calculation, Duct Design, Ventilation, Airconditioning Systems.

MEP 559 Energy and Environment

Gaseous and Solid Pollutants, Formation Mechanism of Gaseous and Solid Pollutants During Combustion Processes Within Boilers, Industrial Furnaces and Gas Turbines, Formation Mechanism of Pollutants in Internal Combustion Engines, Control of Pollutants Formation in Boilers, Industrial Furnaces and Gas Turbines, Control of Pollutants in Internal Combustion Engines, Thermal Pollution from Cooling Processes of Power Producing Equipment.

MEP 560 Solar Energy

General Idea About The Solar Energy, Its Intensity in The Outer Space and The Motion of The Earth with Respect to The Sun, The Angles of Solar Rays on Earth. Different Models for Calculating Solar Energy Intensity and The Fraction Dispersed Through The Earth's Atmosphere. Theory of Solar Collectors and Equations Defining The Glass Cover Transmissivity, Thermal Losses and Thermal Efficiency, Solar Collector Performance and Its Effect on The Phase of The Fluid Flowing Through The Collector.

MEP 561 Wind Energy

An Introduction to Wind Energy, Survey of Wind Energy, Measuring Instrumentation for Wind Velocity and Direction, Theoretical Study of Wind Energy, Wind Turbine Blades, Horizontal and Vertical Axis Wind Turbines, Control System, Wind Energy for Pumping and Electricity Generation. Computer Programs for Calculating The Turbine Power, Wind Measurements. Design of Wind Turbines Through The Application of The Appropriate Aerodynamic Theories.

MEP 562 Practical Applications of Renewable Energy

Solar Heating, Solar Dryers, Solar Electricity Generation, Photovoltaic Cells, Solar Boilers. Solar Desalination, Solar Cookers, Solar Refrigerators and Air Conditioners, Solar Pumping, Wind Electricity Generation, Wind Pumps.

MEP 563 Renewable Energy Sources and its Environmental Impact

Solar Energy, Wind Energy, Wave Energy, Bio-Mass Energy, Tidal Energy, Solar Ponds, Geothermal Energy, Agricultural and Organic Waste Energy. The Environmental Impact of The Utilization of Solar, Wind and Water Potential Energy.

MEP 564 Energy Storage

Need to Storage, Types of Energy Storage: Biological, Chemical, Thermal, Electrical, Mechanical. Pumped Storage: Requirements, Working Principle, Economic Justification, Advantages of Pumped Storage, Site Selection, Classification, Machinery, Lakes, Power Houses, Typical Plants.

MEP 565 Sea Wave Energy

Introduction. Sea Wave Characteristics, Wave Energy Conversion to Mechanical Energy, Mechanical Energy Conversion Into Other Usable Forms, Tides, Tidal Energy, Construction of Moving Prevention Devices, Environmental, Social and Industrial Considerations, Typical Plants.

MEP 566 Bio-Energy

Energy Sources and Their Classifications, Conventional Energy Conversion, Power Plants and Vapor Cycles, Methods of Bio-Mass Conversion Into Energy, Biological Methods, Aerobic and Anaerobic Fermentation, Thermo-Chemical Methods Direct Combustion, Gasification (Partial Combustion) and Pyrolysis, Practical Applications of Bio-Mass Conversion Into Energy, The Use of Gaseous Fuel in Internal Combustion Engines.

MEP 567 Thermodynamics (2)

Applications on First and Second Law, Entropy, Properties of Compressible Fluids. Adiabatic Flow with Friction, Flow with Heat Transfer.

MEP 568 Control of Industrial Furnaces, Boilers and Industrial processes

Introduction and Basic Definition, Advanced Process Dynamics, Industrial Controllers (Design, Tuning, Maintenance), Optimum Controllers and Tuning, Final Control Elements (Servo-Motors, Valves, Design, Choice and Maintenance), Identification of Control Systems and Processes in Open Loops and Closed Loops, Introduction to Nonlinear Control Systems (Relay Control Systems, Harmonic, Linear), Introduction to Stochastic Systems, Control Systems for Burners, Boiler Feed Water and Pressure Control to Regulate The Boiler Operation, Control of Total Dissolved Solids in Boiler Water, Safety Valves.

MEP 572 Automatic Control in Engines

Automatic Control Systems. Classification of Control Systems, Block Diagram, Engine Steady State Conditions, Engine Unsteady State Conditions, Engine Differential Equations, Engine As a Plant Controlled By The Crankshaft Rotational Speed, Engine As a Plant Controlled By The Cooling Water (Air) Temperature, Selection of Control Method, Direct Acting Governors, Indirect Governors, Electronic Governors, Dynamic Proportion of Governors and Their Components, Stability of Automatic Control Systems.

MEP 573 Performance of Internal Combustion Engines

Introduction to Supercharging, Supercharger Types and Efficiency, Matching Superchargers (Mechanically Driven), Utilization of Exhaust Gas Energy, Matching Turbochargers, Pulse Converters, Two Stage Turbo-Charging Pressure Exchangers, Turbo-Charging of Petrol Engines, Analytical Matching and Performance Prediction Methods, Elementary Methods, Quasi Steady Methods, The Gas Exchange Process. Filling and Emptying Methods, Transient Response Models.

MEP 574 Testing and Calibration of Internal Combustion Engines

Test Cell As a Thermodynamic System, Test Cell Design, Control Room Ventilation, Cooling Water, and Exhaust Gas Systems, Fuel and Oil Storage and Supply, Types of Dynamometers and The Measurement of Torque, Coupling The Engine to The Dynamometer, Test Cell Control and Data Acquisition, Measurement of Fuel, Combustion Air and Oil Consumption, Measurements of Heat and Mechanical Losses, Measurement of Exhaust Emissions, Vibration and Noise Analysis, Cylinder Pressure Recording and The Rate of Heat Releases Analysis, Engine Calibration and Mapping, Statistical Analysis of Test Results, Correction of Results to The Standard Conditions.

MEP 575 Foundations and Vibrations of Engines

Calculation of The Pressure Variation During The Engine Cycle, Force Analysis for The Piston, Connecting Rod and Crank Shaft for a Single Cylinder, Force Analysis for Multi-Cylinder Engines, Torsional Vibrations, Engine Foundations, Dampers, Types, Design, Calculation of Deflection of Dampers. Frequency of Vibration of Dampers, Resonance.

MEP 576 Steam Power Stations

Conventional Thermal Cycles, Combined Cycles, Cogeneration, Power Plant Site Selection, Fuels and Combustion, Fuel Burning Equipment, Power Stations and Environment, Draught Systems, Water Treatment, Steam Piping

MEP 577 Gas Turbine and Diesel Engine Power Plants

Gas Turbines: Classifications ,Open and Closed Cycle, Thermal Efficiency Improvement, Arrangement of Plant Components, Combustion Chambers, Performance. Diesel Power Plants: Main Systems of The Plant, Plant Layout, Combustion Chambers, Engine Performance, Engine Supercharging, Dual Diesel Fuel Engines, Fuel Injection Systems.

MEP 578 Nuclear Power Stations

Principles of Nuclear Energy, Nuclear Fusion and Fission, Radioactivity, Decay Rate and Half Lives, Neutron Flux and Reaction Rates, Pressurized Water Reactor Power Plants, The Boiling Water Reactor Power Plants, The Gas Cooled Reactor Power Plants, The High Temperature Gas Cooled Reactor, Power Plants, The

Pressurized Heavy Water Reactors, The Fast Breeder Reactor Power Plants, The Liquid Metal Fast Breeder Reactors, Cladding and Structural Materials, Shielding Materials, Disposal of Nuclear Waste.

MEP 579 Control and Safety Instruments in Power Stations

Instrumentation for Measuring The Temperature, Pressure, Fluid Flow, Gas Concentration, Water Purity, Smoke and Dust Concentration in The Exhaust Gases. Control of Steam Temperature, Control of Steam Pressure, Control of Station Load, Control of Electric Frequency of The Alternator, Control of Thermal, Gas, and Noise Pollution from Power Stations, Protection Measures of Power Station Components.

MEP 580 Operation and Maintenance of Thermal Power Plants

Starting and Loading of Power Plant Units, Stopping of Units, Speed and Load Regulation, Parallel Operation of Units, Synchronization, Load Sharing between Units, Tests on Boilers, Turbo-Alternators, Condensers, Pumps...etc. Reliability Tests, Acceptance Tests. Guarantee Figures, Performance Characteristic Tests. Alarm Signals and Remedy of Its Causes, Automatic Tripping and Causes (Excessive Vibrations, Over-Speed, Loss of Vaccam, Failure of Thrust Bearings), Diagnosis of Faults and Maintenance Work.

MEP 581 Project Management

Principles of Management, Functions of Enterprises: Production, Personal, Accounting ,Marketing, Quality Engineering Control. Basic Problems Facing Project Management ,Demand Forecasting, Factors Affecting The Production of The Enterprise, Importance of Cost in Project Management, Methods and Techniques of Pricing, Project Follow Up and Final Report Writing, Total Quality Application in Efficient Project Management, Engineering Approach to Improve Project Performance, Case Studies.

MEP 600 Combustion Engineering

Introduction to Combustion, Mass and Heat Transfer, Vaporization of Liquid Fuel Droplets Introduction to Diffusion Combustion, Vaporization of Liquid Fuel Droplets, During Combustion Laminar Diffusion Flames. Turbulent Diffusion Flames, Kinetically Influenced Combustion Phenomena, Introduction to Chemical Kinetics, Spontaneous Combustion, Well Stirred Reactor, Flame Stabilization By Bluff Bodies, Laminar Flame Propagation, Spark Ignition.

MEP 601 Advanced Thermodynamics

Applications of The First and The Second Laws of Thermodynamics, The Entropy, Entropy Changes in Reversible and Irreversible Processes, The Principle of Increase of Entropy, Mixtures of Gases, Its Properties, Processes, Gas and Vapor Mixtures and Its Properties, The Reversible Work, Availability and Irreversibility, The Thermodynamic Relations, The Equations of State, The Fugacity, Properties of Compressible Fluids, Flow of Compressible Fluids in Nozzles and Blade Passages: The Reversible Adiabatic Flows, The Adiabatic Flow with Friction, Chemical Reactions and Combustion: Chemical Analysis, Enthalpy of Formation, Internal Energy and Enthalpy of Combustion, First Law for Reacting Systems, Efficiency of Combustion, Adiabatic Flame Temperature, Phase Equilibrium.

MEP 611 Advanced Fluid Dynamics

Euler's Equation of Motion, Continuity Equation, Irrotational Flow, Velocity Potential, Laplace Equation, Stream Function in Two Dimensional Flow, Two Dimensional Sources and Sinks, Two Dimensional Doubles, Circulation, Combined Flows, Complex Variables, Conformal Mapping, Steady Flow Around Circular Cylinders and Circular Arcs, Joukowski Airfoil, Equations for Viscous Flow, Flow between Parallel Boundaries, Flow between Concentric Cylinders, Theory of Lubrication.

MEP 612 Multi-Phase Flow

Fundamentals for Phase Equilibrium of Single Materials and Mixtures. Basics of Dynamic Equilibrium and Equations for Bubble Growth Dynamics, Momentum and Viscosity Effects. Two Phase Flow Regimes (Gas-Liquid), Models for Void Fraction and Pressure Drop Calculations. Boiling Modes.

MEP 613 Water Power Engineering

Study of Flow Data and Water Power Estimates. Hydraulic Turbines. Power Plant Construction, Waterways and Penstocks, Power House Equipment, Plant Accessories, Speed and Pressure Regulation, Water Hammer, Causes, Effects and Protection. Cost and Value of Water Power, Pumping Storage Constructions.

MEP 614 Unsteady Flow of Fluids

Incompressible Fluids: Pipe Networks, Water Hammer in Pumping Stations, Resonance in Pumps, Water Hammer in Turbines and Reciprocating Pumps, Column Separation and Entrapped Air, Methods of Controlling Transients, Oil Pipeline Water Hammer Transients, Computer Programming Aids. Compressible Fluids: Fundamental Mathematics, Solution By Patterns, Flow in Constant Cross-Section Channels, Other Applications.

MEP 616 Jet Propulsion

Introduction, Basic Gas Turbine Cycles, Actual Gas Turbine Cycles, Performance of Air Compressors, Performance of Turbines. Matching between The Compressor, The Turbine, and The Combustion Chamber, Combustion and Chemical Equilibrium, Flow in Nozzles and between Turbine Blades, Liquid and Solid Propellants, Jet Propulsion Units, Performance of Liquid and Solid Propellant Rockets.

MEP 617 Turbulent Flow

The Nature of Turbulence, Methods of Analysis, Diffusivity of Turbulence, Length Scales in Turbulence Flows, Measurement of Turbulence. The Hot Wire Anemometer, The Laser-Doppler Anemometer, The Equations of Motion. Time Averaging of The Conservation Equations, Turbulent Shear Stress ,Models of Turbulence.

MEP 620 Fluid Mechanics (2)

Kinematics of Fluid Motion, Flow of Incompressible Ideal Fluids, Flow of Compressible Ideal Fluids, Impulse and Momentum Principle, Similitude and Dimensional Analysis, Fluid Flow in Pipes, Fluid Flow Around Immersed Bodies, Fluid Measurements. Basics of Thermodynamics, Isentropic Flow, Waves, Adiabatic Flow with Friction, Thermodynamics of Turbo-Machines.

MEP 621 Aerodynamics (2)

Airfoils and Wings, Other Different Airplane Components, Aerofoil Characteristics. Force Representation, Lift, Drag and Lift/Drag Ratio, Pitching Moment, Aerofoil Balance and Stability, The Aerofoil Dimensions, The Aspect Ratio and Plan Form Influences.

MEP 622 Advanced Turbo-Machines

Introduction, Two Dimensional Cascades, Axial Flow Turbines, Two Dimensional Theory, Axial Flow Compressors, Pumps and Fans, Three Dimensional Flows in Axial Turbo- Machines, Fluid Dynamics Considerations, Detailed Discussion of Turbines, Detailed Discussion on Pumps, Compressors and Displacement Machines.

MEP 624 Gas Dynamics (2)

Adiabatic Flow in Variable Cross- Section Channels with Friction, The Phone Line, The Relish Line, The Fanno Line and Normal Shock Waves, Isothermals in Flow with Friction in a Two Dimensional Constant Cross-Section Duct, One Dimensional Wave Motion, The Weak Shock, The Very Strong Shock, Two Dimensional Flow, The Steady Supersonic Flow, Oblique Shock Waves, The Supersonic Flow Over a Wedge, The Weak Oblique Shock Wave, Supersonic Compression, Supersonic Oppression By Turning, Mayor Function.

MEP 630 Heat Transfer By Conduction

General Heat Conduction Equation, Thermal Conductivity, Steady One-Dimensional Conduction, Resistance Concept, Extended Surfaces, Steady Two-And Three Dimensional Conduction, Unsteady Heat Conduction and Multidimensional Systems, Time Varying Boundary Conditions, Phase Change with Moving Boundaries, Solution Methods, Laplace Transform, Fourier Series, Bessel Functions, Legender Series and Numerical Methods.

MEP 631 Convective Heat and Momentum Transfer

Fundamental Laws, The Continuity Equation and Its Forms, The Momentum Equations in Terms of The Normal and Shear Stresses in Fluids, Stokes Hypothesis and The General Navier, Stokes Equations, Laminar and Turbulent Flows and The Turbulence Level , The General Energy Equation, The Dynamic and Thermal Boundary Layers and Their Equations, The Laminar and Turbulent Flow and Heat Transfer for Fully Developed Flow in Tubes and between Two Parallel Plates, The Von Karman Equations for Turbulent Flows, Fluid Flow, Friction and Heat Transfer in The Developing Laminar and Turbulent Flows, The Similarity and The Integral Solutions in Laminar and Turbulent Flows and Heat Transfer, The Analogy between The Velocity and Temperature Fields, The Reynolds and Colburn Analogy, The Heat Transfer in Turbulent Flow Parallel to a Flat Plate Using The Colburn Analogy –The Empirical Correlations for Heat Transfer in Forced Laminar and Turbulent Fully Developed and Developing Flows in Tubes, Flow Parallel to a Flat Plate, Normal to a Single Tube and Tube Banks, Around a Sphere or Inside Packed Beds of Balls from Fluids and Liquid Metals, Free Convection from Vertical or Inclined Planes, between Two Parallel Vertical Planes, Horizontal Tubes and Their Empirical Corrections for Fluids and Liquid Metals in Laminar and Turbulent Flows, Laminar Film Condensation Over Vertical Planes and Tubes, Horizontal Cylinder or Horizontal Tube Banks ,Transition to Wavy and Turbulent Condensation and The Empirical Correlations, Effect of Liquid Film Subcooling and Vapor Superheat ,The Solution of The Vorticity ,Stream Function, Velocity and Energy Equations By Finite Differences, Typical Solutions for Forced and Free Convection Cases, The Stability Criteria of The Finite Difference Solutions.

MEP 632 Water Desalination

Need to Desalination, Properties of Water and Aqueous Solutions, Engineering and Economic Considerations, Methods of Desalination, Problems Common to Distillation. Multiple Effect Distillation, Multiple Stage Flash Distillation, Vapor Compression Distillation Desalination, Combined Distillation Plants, Distillation with Nonconventional Energy Sources, Separation By Freezing, Ion Exchange Electro- Dialysis, Reverse Osmosis, Design of Desalination Plants.

MEP 633 Boundary Layer Theory

Fundamental Laws of Motion for a Viscous Fluid, The Boundary Layer Concept, Derivation of Navier-Stokes Equations, Creeping Motion, Laminar Boundary Layers, Exact Solutions of The Steady State Boundary Layer Equations, Approximate Methods for The Solution, Thermal Boundary Layers in Laminar Flows, Laminar Boundary Layers in Compressible Flows, Turbulent Boundary Layers.

IVIEP 634 Heat Transfer By Radiation

Radiation from a Blackbody, Definitions and Estimation of Radiative Properties of Nonblack Surfaces, Properties of Real Materials, The Gray Body, Radiation Exchange between Black and Nonblack Surfaces. Thermal Radiation between Gases and Enclosures, Combined Convection and Radiation Heat Transfer, Applications and Numerical Solutions.

MEP 671 Energy Measurements in Thermal Plants, Boilers and Industrial Furnaces

Basic Concepts of Measurements, Problem Analysis, Basic Characteristics of Measuring Devices, Calibration, Sensors and Transducers, Basic Requirements of Transducers, Performance Characteristics of Instrumentation Systems, Zero Order Systems, First Order Systems. Second Order Systems Specifications and Testing of Dynamic Response, Pressure Measurements and Calibration, Flow Measurements and Calibration, Temperature Measurements and Calibration, Data Acquisition and Conversion, Input, Output Devices and Displays. Measurements of Gas Analysis, Liquid Level Sensors and Instrumentation, Measurement Instruments Attached to Boilers and Industrial Furnaces. Renewable Energy Measurements.

MEP 672 Advanced Measurements

Laser Applications for Measurements of Fluid Flow Velocity, Concentration of Combustion Products, Temperature and Soot Concentration, Chromatographic Chemical Analysis of Gaseous Mixtures, Measurements of Flow Velocity with Hot Wire Anemometer, Data Acquisition Systems, High Speed Cameras. Renewable Energy Measurements.

MEP 690 Economics of Power Generation

First and Second Laws Analysis of Thermal Systems. Energy Analysis of Power Cycles, The Cost of Electrical Power Generation, Selection of Type of Generation, Performance and Operating Characteristics of Power Plants, Load Sharing Among Generators, Interest and Depreciation, Present Worth, Annual Fuel Cost, Levelizing Equations, Economic Evaluation Methods. Construction Cost, Operation and Maintenance Costs, Cogeneration, Economic Scheduling Principles, Load Distribution, Variation of Station Cost with Size of Unit.

MEP 691 Turbulent Jets and Wakes Flows

Definitions of Plane Jets and Plane Mixing Layers, Submerged Jet, Jet in a Stream, Two Dimensional Wakes Flow, The Governing Equations to Compressible Fluid Flow (N.S. Equations). Prandtl Simplifications for The Two Dimensional Compressible Boundary Layer Flow. Assumptions for The Mathematical Modeling for The Shear Stress in Turbulent Flow. Two Dimensional Free Turbulent Flow Modeling for Mixing between Streams, Jets and Wakes, Turbulent Mixing between Streams of Different Temperatures and Densities. Equation of Motion, Energy and Diffusion and Their Solution, Reynolds Analogy for The Velocities, Temperatures and Concentrations Profiles. Application for Flow Geometry and Configuration Inside Combustion Chamber of Gas Turbines (Cold Model) and for Film Cooling of Flat Plates.

MEP P99 Project

12. Department of Automotive Engineering

MEA 510 Fault Finding in Vehicles

Distinguishing Between The Strategy of Fault Finding Either By Starting From The Functioning Performance of The Single Components or By Successive Search Starting From The Function Of a Single Group Or of The Car As a Whole, Brief Planning Of a Complete Flowchart Searching for The Fault Depending Upon Visual Inspection and Using Technical Instinct to Allocate The Fault to One or More Groups, Then Using The Method of Group Isolation to Decide Upon The Group Responsible for The Fault and Thus Specifying The Location of The Defect Using Systematic Research with The Aid of Instruction Sheets and Technical Documents and Connecting Circuits, Methods of Automation of The Fault Finding Operations.

MEA 511 Technical Specifications and Tenders Evaluation

General Introduction and Overview of Vehicle Specification and Procurement, Vehicle Utilization and Cost Strategies, Vehicle Life Cycle Costing, Specification Preparation, Car and Light Vehicle Specifications, Medium and Heavy Vehicle Specifications, Specifications Areas for Better Vehicle Performance: Economy Diesel Engines, Clutch or Viscous Drive Fans), Preparing a Functional Specification for Solicitation, Cost and Analysis of Vehicle Bids, Data Gathering, Technical Evaluation, Maintenance Cost in Vehicle Bid Analysis.

MEA 512 Maintenance Engineering

Preventive Maintenance Programs: Engine, Transmission, Brakes, Condition Based Maintenance, Repair Programs, Maintenance Planning.

MEA 513 Industrial Safety

Introduction, Legal Aspects of Labor Protection, Industrial Environment, Health Hazards and Their Protection, Industrial Lighting, Industrial Vibration, Industrial Noise, Prevention of Accidents Due to Electrical Applications, Safety of Pressure Vessels, Fire Protection, Safety Requirements for Industrial Equipment and Processes, Sanitation and Hygiene Requirements for Industrial Establishments.

MEA 514 Total Quality Assurance

Introduction, Goal, Approach, Applicability, Implementation Quality System Documentation Progress, Product Quality Planning Cycle, ISO 9000 Based Requirements, Sector Specific Requirements, Product Part Approval Process, Continuous Improvement, Manufacturing Capabilities, Examples of Customer Specific Requirements, Process Design and Development, Product and Process Validation, Feed Back Assessment and Corrective Action Control Plan Methodology.

MEA 515 Service Station Planning

Productivity and Human Behavior, Designing Workshop's Job-Order, Work Methods Analysis, Work Measurement, Organizational Procedures, Capacity Planning, Facility Layout, Workshop Analysis and Evaluation, Key Performance Indicators.

MEA 516 Workshop Equipment

Necessary Equipment For a Workshop: Auxiliary Equipment: Water, Sewage, Lighting, Compressed Air, Stores: Micro Film, Cardex, Shelves, Mechanical Department: Cranes, Wheel Alignment Equipment, Wheel Balances, Tools for Body Shop, Paint Guns, Oxygen and Acetylene Cylinders, Welding Equipment, Painting Oven, Electrical Department: Battery Charger, Charge Measuring Equipment, Washing and Greasing Department: Cranes, Washing Equipment, Greasing Equipment.

MEA 517 Fault Diagnosis of Injection Systems

Introduction, Wear in Different Parts, Overheating, Clocking, Leakage, Clearances in Different Parts of The Injection System, Determination of The Hydraulic Characteristics of Main Parts, Evaluation of The Performance of The Plunger, Delivery Valve, Injector, Technical Service, Diagnosis of Possible Troubles (Instrumentation), Methods of Repair and Adjustment, Testing and Calibration.

MEA 520 Automotive Engineering (1)

Fundamental Approach to Modeling, Lumped Mass, Vehicle Fixed Coordinate System, Motion Variables, Forces, Dynamic Axle Loads: Static Load, Low Speed Acceleration, Load on Grades, Dynamic Characteristics, Road Loads, Aerodynamic, Rolling, Acceleration Performance, Power Train, Traction and Tractive Effort, Equation of Motion and Maximum Tractive Effort, Vehicle Performance, Braking Performance, Basic Equation, Braking Forces, Brake Factors and Efficiency, Steering System, Low Speed Turning.

MEA 521 Automotive Engineering (2)

Mechanics of Pneumatic Tires, Tire Construction, Forces and Moments, Rolling Resistance, Tractive and Braking Effort, Cornering Properties, Camber Thrust, Ride Properties, Performance Characteristics of Road Vehicles, Maximum Tractive Effort, Gradability, Acceleration, Time and Distance, Braking Performance of Two Axle Vehicles and Semi Traitors, Brake Proportioning, Anti-Lock Brake Systems, Handling Characteristics of Road Vehicles, Steady State Handling Characteristics, Testing of Handling Characteristics.

MEA 522 Pneumatic and Hydraulic Systems

Fixed Displacement Hydraulic Pumps, Variable Displacement Hydraulic Pumps, Pump Controls and Systems, Hydraulic Motors, Hydrostatic Transmission, Components of Pneumatic Systems, Types of Compressors (Classifications and Performance), Design of Control System for Pneumatic Equipment, Pneumatic Motors Performance, Pneumatic Motors in Construction Machinery.

MEA 523 Air Pollution

The Nature and Consequences of Pollution Problems, Nitrogen Oxides Formation, Carbon Monoxide Formation in Both Spark- and Compression-Ignition Engines, Unburned Hydrocarbon Emissions in Both Spark- and Compression-Ignition Engines, Particulate Emissions in Spark-Ignition Engines, Distribution of Particulates in Engine Cylinders, Formation of Carbon Layers and Oxidation, Absorption and Condensation, Exhaust Gas Treatment.

MEA 524 Vehicle Aerodynamics

Aerodynamic Forces and Moments, Air Viscosity Phenomena, Aerodynamic Lift: Ground Lift-Reducing Using Styling, Spoilers, and Negative Lift Devices, Effect of Aerodynamic Forces on Performance, Speed, Fuel Consumption, Acceleration, Cornering, Braking, Rolling, Pitching, Yawing Moments, Aerodynamics and Styling, Fundamental Analysis of Forces Affecting Car Stability, Effect of Aerodynamic Forces on Steady State Stability and Transient Stability.

MEA 525 Braking Systems

Legal Regulations for Vehicle Brakes, Classification of The Vehicle Brake Systems, Drivers Assisting Devices, Types of Energy and Transmission Media, Braking Force Distribution for Passenger Cars and Medium and Heavy Commercial Vehicles, Braking Force Regulation Devices According to Axle Load, Anti-Lock Brake Systems (ABS), Brake Retarders, Braking Time and Distance, Methods for Measuring Brake Efficiency.

MEA 530 Vehicles Design (1)

Optimal Design: Problem Definition, Optimization Criteria, Optimization Parameters, Use of Finite Element Analysis in Optimal Design, Applied Examples, CAD System: Advanced Rendering and Ray Tracing, Generating Drawings and Dimensioning, Finite Elements Modeling: Nonlinear Material Behavior, Large Strain Analysis, Large Displacement Analysis, Applications: Automotive Engine Parts, Suspension, Transmission, Brake Systems.

MEA 531 Testing and Calibration (1)

Principals of Strain Measurements, Stress and Strain, Strain Gauges, Strain Gauge Bridges, Strain Gauge Adhesives and Sealing Methods, Selection of Correct Gauges, Source of Error in Strain Gauge Measurements, Design of Force Cells, Torque Cells, Pressure Cells, Methods of Calibrating Load Cells, Displacement Transducers, Theory of Operation, Types and Calibration, Acceleration Transducers, Theory and Applications, Selection of Correct Transducer, Engine Dynamometers, Types, Principal of Operation and Calibration.

MEA 532 Testing and Calibration (2)

Instruments For: Oil Pressure, Fuel Level, Braking System, Temperature, Lighting, Automotive Chassis Dynamometer, Automotive Gas Analyzer, Automotive Engine Analyzer, Hydraulic Test of The Plunger and Its Injector, Fuel Atomization, Pressure Measurement in The Delivery Pipe, Fuel Injection Rate Measurement, Measurements of The Cam Follower Mechanism.

MEA 533 Mechanical Stresses in Fuel Systems

Introduction, Main Parts, Materials, Deformations, Hardness, General Directions to Increase The Reliability and Service Time of The Fuel System, Factors Affecting The Mechanical Stresses in The Injection System, Methods of Calculation of Injection Systems with Minimum Mechanical Stresses, Contact Stresses Between Cam and Follower, Selection of Plunger Size, Principles of The Design of Injectors, Thermal Protection of The Atomizer, Selection of The Fuel System Parameters Using The Reverse Method, Design and Thermal Protection of Atomizer.

MEA 534 Automotive Accident Analysis

Definitions, One Dimensional Motion, Two Dimensional Motion, Forces, Work and Energy, Momentum and Collisions, Circular Motion and the Law of Gravity, Rotational Equilibrium and Dynamics, What is Reconstruction, Restitution Coefficient, Types of Impacts, Collision Reconstruction Techniques, Damage-Based Reconstruction Techniques, Trajectory-Based Reconstruction Techniques.

MEA 535 Reverse Engineering Applications

Methods of Product Inspection, Studying History of Product in Operation, Deduction of The Product Function, Determination of Controlling Dimensions, Functional, Usage, Mounting, Testing of Materials According to Standard Techniques and Materials Standards, Preparation of Design Documents in View of Available Capabilities Testing Techniques for The Final Products.

MEA 536 Vehicle Design (2)

CAD System, Fundamentals Viewing Design, Placing Element in 2D Drafting Aids Manipulating Modifying Elements, Using Cells, Reference Files 3D Design and Modeling, Rendering and Visualizing 3D Models, Generating Drawings, Finite Element Modeling, Linear Static Nonlinear Static and Modal, Thermal Steady and Transient, and Frequency Response Analysis, Applications, Automotive Engine Parts, Suspension, Transmission, Brake System.

MEA 537 Finite Elements Applications in Vehicles

Finite Element Technique, Type of Elements, Mesh Generation, Application and Vehicle Components in The Case of Linear and Non-Linear Behavior, Static Analysis, Dynamic Analysis.

MEA 540 Fuel Injection Systems (1)

Jerk Pump, Rotary Pump, Common Rail System, Accumulator System, Pneumatic System, Unit Injectors, Electronic System, Mechanical Governor, Hydraulic Governor, Pneumatic Governor, Direct Governor and Indirect Governor.

MEA 541 Friction Wear and Lubrication (1)

Types of Friction, Petroff's Law, Hydrodynamic Theory, Bearing Design Consideration, Bearing Performance, and Pressure Fed Bearing, Friction of Internal Combustion Parts, Oil Requirement, Lubrication Systems of Engines, Greases and Seals.

MEA 542 Theory of Fuel Injection

Introduction, Classification, Methods of Fuel Injection, Requirements of The Injection System, Theory and Methods of Calculations of The Injection System, Determination of The Effect of The Different Parameters on The Injection Characteristics and Fuel Atomization, Methods of Calculations of The Main Dimensions of The Fuel Injection System, Evaluation and Development of The Injection System, Reverse Method of Calculation of The Fuel System.

MEA 543 Fuel Economy

Basic Requirements for Fuel, Basic Components of Vehicle Fuel Consumption, Effect of Engine Design, Transmission Ratio, External Resistance Forces on The Fuel Consumption, Methods of Reducing Fuel Consumption Engine Specific Fuel Consumption Maps, Impact of The Driving Behavior on Fuel Consumption, Vehicle Economical Speed, Driver's Alarming Systems to Economical Fuel Driving.

MEA 544 Matching of Fuel Injection Systems

Speed Characteristics of The Fuel Injection System, Effect of Different Parts of The System on Its Performance, Determination of The Type and Size of Delivery Valve to Obtain The Required Speed Characteristics, Determination of The Type and Dimensions of The Governor for Optimum Injection Characteristics, Selection of The Fuel Systems for Engines Operating Under Different Operating Condition.

MEA 550 Hoisting and Handling Equipment

Types of Fixed and Mobile Cranes, Forces Acting on The Equipment and Its Components, Preparation and Stability of Cranes on Site, Determination of The Power and Productivity of The Belts and Conveying Buckets.

MEA 551 Power Generation Equipment

Classifications of Power Installation of Construction Machinery: Prime and Secondary Movers, Characteristic and Performance Study of Prime Mover: Steam Engine, Internal Combustion Engine, Secondary Mover, Components: Hydraulic, Pneumatic and Electric Motors, Performance Study of Hydraulic and Pneumatic Motors, Control Systems of Power Installation Equipment.

MEA 552 Crushing and Mixing Equipment

Types of Crushers, Function, Determination of Power and Productivity, Factors Acting on Crushers Systems, Performance and Productivity of Surface and Eccentric Sieves, Productivity of Washing Equipment, Performance and Productivity of Mixtures Containing Cutters and Milling Tools, Cylindrical Mixing Equipment and Mixing Equipment Equipped with Blades.

MEA 553 Earth Moving Equipment

Adhesion Between Tire or Crawler and Soil, Equation of Moving and Stability of Tractors, Performance Curves of Tractors, Theory of Cutting and Earth Moving, Performance and Productivity of Different Equipment Used in Cutting and Compacting The Soil: Bulldozer, Scraper, Grader, Digger, Compactors.

MEA 554 Loading and Unloading Equipment

Evacuation and Transport of Loose Materials, Mobile and Stationary Evacuation Equipment, Productivity, Performance and Types of Dump Trucks and Loaders, Packing Equipment, Belts and Conveying Buckets.

MEA 560 Vehicle Control

Introduction to Optimal Performance of Engines, Modeling for Optimal Performance (Analogue, Digital), Electronic Injection Control Systems (Gasoline and Diesel), Electronic

Ignition Systems, Control of Valve Timing, Control Systems in Transmission, Matching of Car Control Systems, Design of Car Control Systems.

MEA 561 Car Electronics (1)

Study of Field of Application of Electronics in Modern Cars, Principles of Integrated Circuits (Analogue Digital), with Applications in Cars, Instruments Used in Electronic Measurements, Electronic Systems in Car Engines :Ignition, Injection, Electronic Systems in Car Chassis: ABS, ASR, Differential Lock, Steering, Crash Avoidance Systems, Electronic Systems in Car Body: Air Bag Module, Driver Information and Display.

MEA 562 Automatic Driving Systems

Optimal Performance of Vehicle Drive, Simulation of The Optimal Performance in Vehicles, Automation of Driving Processes in Vehicles, Sensing Equipment Transmission Equipment Necessary for Automatic Driving, Automatic Driving Systems for Forward and Backward Driving.

MEA 563 Safety and Traffic Control

Introduction About Traffic Rules and Legislation, Modeling of Traffic, Study of The Theory of Queues and Parking, Traffic Control Equipment, Traffic Controllers, Optimal Control in Big Traffic Systems, Automatic Suspension Systems, Automation of Comfort Equipment in Vehicles: Moving Seats, Adjusting Air Conditioning, Limiting The Maximum Speed, Automatic Braking Systems, Other Safety Equipment: Air Bag, Luxury Equipment.

MEA 564 Automation of Diagnostic Process

Introduction About The Strategy of Fault Diagnosis, Control Systems of Fault Monitoring, Devices and Equipment of Automatic Fault Diagnosis, Modeling of Methods of Diagnosis, Data Collection Systems and Data Processing, Design of Flow Charts for Fault Diagnosis Procedures, Programming of Fault Diagnosis Systems.

MEA 570 Transportation Economics

Historical Background About The Evaluation of Transportation, Modes of Transportation, Criteria of Choice, Variation in Specification According to Use, Public Transport, Estimation of Fleet, Effect of Vehicle and Road Parameters on Costs, Economic Evaluation of Transportation Plans, Vehicle Operating Cost, Value of Travel Time Savings, Accident Cost, Net Present Value, Replacement Policy, Inventory Control, Effect of Fuel Prices on Economy of Transport.

MEA 571 Operation Cost Analysis

Vehicle Operation Cost: Background, Theory, Estimates of Cost Components, Fuel and Lubrication Costs, Fuel Consumption Models, Fuel Consumption Equation and Prediction: Cars, Light Goods Vehicles, Buses, Trucks, Lubricant Costs, Tire Costs: Tire Costs Data, Estimation of Tire Cost Equations, Tires Consumption: Cars, Light Goods Vehicles, Buses, Trucks, Maintenance Costs, Collection of Data, Statistical Analysis, Maintenance Parts Costs, Total Vehicle Operating Cost: Calculation of Transportation Cost, Cost of Transportation Services.

MEA 572 Stores Organization and Management

Nature of Inventories, Fixed Order Quantity Systems, Fixed Period Quantity Systems, Single Period Inventory Models, Realities of Inventory Planning, Materials Management and Purchasing.

MEA 573 Operational Management and Productivity

Operation Environment, Transport Forecasting, Vehicle Productivity and Job Analysis, Operation Planning, Performance Assessment.

MEA 580 Air Cushioned Vehicle

Introduction, Air Cushion Generation, Different Theories, Air Cushioned Vehicles Main Components, Different Applications: Hovercraft, Water Transportation, Thermal Treatment for Sheet Metals in The Field of Agriculture, Off-Road Transportation Networks, Design of Air Cushioned Vehicles: Hull Structure, Lift Systems, Propulsion or Thrust Systems and Control Systems, Performance of Air Cushioned Vehicles, Safety and Security Characteristics.

MEA 590 Design of Composite Materials

Material Properties, One Dimensional and Two Dimensional Elasticity Properties, Stress and Strain, Maximum Strain Criterion, Transformation Relations for Compliance and Modulus Matrix and Module for Random Composites, Micro Mechanics, in Plane Properties, Symmetric Laminates, Stress Strain Relations, Flexural Properties, Failure Theories Structural Elements, Laminated Composite Beams, Long Cylindrical Tubes, Columns, Thermal Stresses and Sizing for Stiffness.

MEA 591 Composite Materials Fabrication

Methods of Manufacturing Composites: Artisanal Methods, Middle Series Methods, Large Series Methods, Continuous Methods, Manufacture of Hollow Bodies, Examples of Some Machines Used, Criteria for Choosing a Certain Manufacturing Method, Defects Liable to Occur During The Manufacturing Process.

MEA 610 Maintenance Management

Decision Making and Failure Statistics, Reliability Engineering and Maintenance, Maintenance Planning, Organization of Maintenance Resources, Quantitative Techniques As an Aid to Maintenance Organization, Spares Inventory Control, Network Analysis for The Planning and Control of Maintenance Work, Condition Based Maintenance, Management Techniques in Maintenance, Behavioral Science and Maintenance Management.

MEA 611 Maintenance, Replacement and Reliability

Maintenance Problems, Maintenance Control and Mathematical Models, Statistical Preliminaries, Present Value, Replacement Decisions, Inspection Decisions, Overhaul and Repair Decisions, Organizational Structure Decisions, Reliability Decisions, Scheduling and Sequencing Decisions.

MEA 620 Theory of Vehicles

Mechanics of Pneumatic Tires, Tires Forces and Moments, Construction, Relation Between Longitudinal Forces and Slip, Mathematical Interpretation, Cornering Properties of Tires,

Static, Dynamic, Non Rolling and Rolling Stiffness, Vehicle Ride Characteristics, Vehicle Models: 2 Degrees of Freedom Model for Sprung and Unsprung Mass, 2 Degrees of Freedom Model for Pitch and Bounce, Introduction to Random Vibration.

MEA 621 Pneumatic and Hydraulic Systems

Hydraulic Pumps: Fixed Displacement and Variable Displacement Hydraulic Pumps, Pump Control Systems, Hydraulic Motors: Linear Hydraulic and Rotating Hydraulic Motors, Hydrostatic Transmission: Pneumatic System Components, Types of Compressors, Performance, Design Control Systems of Pneumatic Equipment, Matching of Systems in Hydraulic and Pneumatic Equipment, Servo and Automotive Application of Pneumatic and Hydraulic Equipment.

MEA 622 Vehicle Dynamics

Introduction, Modeling, Dynamic Axle Loads, Acceleration Performance: Power Limited Acceleration, Traction Limited Acceleration, Braking Performance: Basic Equations, Braking Forces, Tire Road Friction, Road Rolling Resistance, Vehicle Response Properties, Steady State Cornering, Suspensions, Steering: Linkages, Forces, Moments, Models, Roll Over, Tires: Tire Construction, Tractive Properties, Cornering Properties, Aligning Moment, Combined Braking and Cornering.

MEA 630 Design of Experiments

Introduction, Basic Definitions, Optimization Parameter, Factors, Confidence Limits, Notes on The Statistical Analysis of The Results, Factorial Experiment, Fractional Factorial Experiment, Processing The Results Of an Experiment, Decision Making After Constructing a Model, Steepest Ascent Along a Response Surface, Decision Making After a Steepest Ascent, Discussion of The Results.

MEA 631 Measurement Systems

Introduction, Force Measurement, Pressure Measurement, Flow Measurement, Temperature Measurement, Signal Conditioning, Indicating and Recording Devices, Measuring Systems and Their Calibration, Testing of Internal Combustion Engines, Control Systems.

MEA 632 Vehicle Design (3)

Design of Vehicle Components, Optimal Design: Problem Definition, Optimization Criteria, Optimization Parameters, CAD System, Finite Elements Modeling: Large Strain Analysis, Large Displacement Analysis, Applications: Suspension, Transmission, Braking Systems, Engine Parts, Vehicle Body.

MEA 640 Fuel Alternatives

Types of Automotive Fuels, Comparison Between Fuel in Terms of Heating Value, Octane Number, Combustion, Natural Gas As an Ideal Fuel in Terms of Pollution and Economy, Other Natural Gas Qualities, Conversion Methods in Gasoline and Diesel Engines, Conversion Kits Components and Comparison.

MEA 641 Friction Wear and Lubrication (2)

Mechanisms of Friction, Types of Friction Mechanical, Viscous, Friction in Parts of Internal Combustion Engines, Study of The Characteristics of Wear in Car Parts, Mechanisms of

Wear, Properties and Performance of Brake and Clutch Lining: Change in Coefficient of Friction and Rate of Wear, Tire Friction, Tire Wear, Petroff's Law, Hydrodynamic Theory of Lubrication, Hydrostatic Theory of Lubrication, Bearing Design Consideration, Pressure Fed Bearings, Lubricating Oil Requirements, Lubricating Systems in Engines, Greases, Testing of Lubricating Oils, Seals.

MEA 642 Fuel Injection Systems (2)

Electronic System, Mechanical Governor, Hydraulic Governor, Pneumatic Governor, Direct Governor, Indirect Governor, Effect of Different Parts on The Injection Characteristics, Development of Fuel System, Injection System of S. I. E.

MEA 663 Car Electronics (2)

Study of Field of Application of Electronics in Modern Cars, Principles of Integrated Circuits (Analogue Digital), with Applications in Cars, Instruments Used in Electronic Measurements, Electronic Systems in Car Engines (Ignition, Injection), Electronic Systems in Car Chassis: ABS, ASR, Differential Lock, Steering, Crash Avoidance Systems, Electronic Systems in Car Body: Air Bag Module, Driver Information and Display, Study of Theory of Operation of The Electronic Control Unit (ECU) and How to Build Its Alternative.

MEA 680 Stability of Air Cushioned Vehicle

Dynamic Stability of Air Cushioned Vehicles, Non Linear and Linear Performance of Air Cushioned Vehicles, Active and Semi-Active Control of Vehicles Air Cushioned Suspension, Influence of Components of Air Cushioned System on Stability (Engine, Lift Fan and Ducting), Study of Hybrid Wheeled Air Cushion Vehicle Suspension.

MEA P98 Project (1)

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work with Complete Analysis in Topic Relevant to The Diploma Field of Study.

MEA P99 Project (2)

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work with Complete Analysis in Topic Relevant to The Diploma Field of Study.

13. Department of Mechatronics Engineering

MCT 512 Mechatronic Mechanisms

Introduction to Mechatronics Mechanism Design And Simulation, Advanced Mechanism Synthesis, Computer-Aided Modeling And Analysis, Advanced Mechanism: Handling Mechanisms, Transporting Devices, Automatic Feeding And Orientation Devices, Vibratory And Non-Vibratory Feeders, Conveyor Systems, That Sort, Weigh, Gripers, Steering Mechanisms, Machine Applies Labels From Stacks Or Rollers, Lifting Mechanisms, Automatic Assembly, High-Speed Automatic Assembly, Precision And Flexure Mechanisms For Precision Engineering, Case Studies Industrial.

MCT 513 Advanced Mechanical Design

Introduction To Mechanical Design Principles And Strategies, Generation And Evolution Of Ideas, Concepts Of Optimal Design, Design Requirements Of Mechatronics Systems, Advanced Stress Calculation, Strength, Impact, Fatigue And Failure Analysis Of Machine Components And Mechanical Structures, Strategies Of Finite Element Analysis, Use Of Computer-Based Tools For Advanced Mechanical Design, Case Studies.

MCT 514 Industrial Electronics Applications in Mechatronics

Introduction to Industrial Electronics in industry, Semiconductor Devices, Power Diodes-Types, Power Transistors and Their Industrial Applications, Thyristors Family, Triac, Power MOSFETs, IGBTs, Controlled Rectifiers, Single Phase and Three Phase Converters, Design of Converter Circuits. Linear Power Amplifier, DC Choppers, Pulse Width Modulation (PWM), Case Studies From Industry.

MCT 515 Precision Actuators

Introduction to Precision Actuators, Types of Precision Actuators, Applications and Control Methods Of: Electrical, Pneumatic, Hydraulic, and Artificial Muscles, Advanced Actuators: Piezoelectric Actuator, Shape Memory Actuators (SMAs), Electroactive Polymer Actuators (EAPs).

MCT 516 Embedded Systems

Overview of Embedded Systems, Architecture and Real-Time Systems, Embedded System Components, Design of Embedded Systems According to Real Time Hardware And Software Components, Communications, Linking, Interfacing and Processing Techniques for Embedded Systems, Embedded Systems Applications In Mechatronics.

MCT 517 Embedded Systems (1)

Review of Digital Logic and Computer Architecture Concepts, Layers of The Virtual Machine, Place of The ISA Layer, Up-To-Date Microcontroller Architecture, Registers, Buses, and Memory Organization, ISA Layer, Addressing Modes, Instruction Set, Principles of I/O Interfacing, Interfacing Examples, Reactive Real-Time Systems.

MCT 518 Modern Automatic Control

Introduction to Modern Automatic Control Engineering, Automatic Control Theories for Feedback Systems, Performance Specification for Robust Control Systems in Mechatronics

Systems, State Space Models, Model Linearization, Time and Frequency Response Analysis, Control System Analysis Techniques, Including Sensitivity, Stability, System Response and Performance Characteristics, Modern Tuning Techniques for Controller Parameters, Digital Controller, Computer Based Controllers.

MCT 519 Nanotechnology Applications in Mechatronic Systems

Introduction to Nanotechnology, Materials, Properties and Characteristics, Nanotechnology Applications in Mechatronics, Examples of Actuators with Nano Strokes, Sensors with Nano-Precision, Design of Flexure Mechanisms, Nanotechnology Applications in: Motion Precise Control Systems, Precise Machining, Servo Hydraulic Valves and Electronics Microscope.

MCT 610 Design of Mechatronic Systems

Mechatronics Systems Components, Intelligent Mechatronics Product's Elements, Selecting, Designing and Marketing for Mechatronics Product, Mechatronics Product Design Techniques, Integration Between Different Design Techniques, Decision Making in Design, Select a Suitable Technology to Design and Produce a Mechatronics Product, Technical Skills to Build Mechatronics Systems, Practical Application to Test, Design and Implement a Mechatronics Product.

MCT 617 Embedded Systems (2)

Programming Examples, Discipline, Methods, and Process of Assembler Program Development, Machine Instruction Format and Instruction Timing, Interface Between OS, ISA and RTL Layers of The Virtual Machine Model, Interrupts, Privilege States and Exception Handling, Programming Examples with Algorithm Analysis.

MCT 618 Selected Topics in Mechatronics Engineering

Selected Topics Are Chosen According to Students' Requirements to Cover Modern and Up to Date Developments in Mechatronics Engineering.

MCT 620 Supervisory Control Design of Discrete Event Systems

Modeling and Analysis of Discrete Event Systems: Introduction to Discrete Event Systems (DES), Modeling of DES Using Automata, Analysis of DES Modeled by Petri Net, Timed Models of DES: Timed Automata, Supervisory Control of Discrete Event Systems: The Feedback Loop of Supervisory Control, Fundamental Theorems for Controller Existence, Dealing with Uncontrollable Events, Dealing with Unobservable Events, Decentralized Control of DES, Some Recent Research Directions in DES.

MCT 621 Motion Control and Servo Systems

Review of Mechanics, Force and Torque Balance, Characteristics of Motion Elements, Parameter Measurement, Elements of a Motion Control System, System Requirements, Position, Velocity and Torque/Acceleration Controls, Sensors in Motion Control: Position, Velocity and Acceleration Sensors, Voltage and Current Sensors, Force and Torque Sensors, Motion Actuators: Analysis of The Dynamics of Induction, Brushless DC and Synchronous machines, Scalar VS Vector Control, Parameter Sensitivity and Identification, Stepping and Switched Reluctance Motors, Static and Dynamic Characteristics, Piezoelectric Motors, Motion Systems, Machine, Converter and Controller , Motion Control System Design: Stability, Hierarchical Design Techniques, Error Analysis and Elimination, Disturbance Rejection.

MCT 622 Mechatronic Systems Modeling and Identification

Fundamentals of Signal and System Models, Simulation, Prediction and Control, Nonparametric Identification: Time and Frequency Response Analysis, Fourier Analysis, Parametric Identification: Prediction Error Methods, Least Squares, Maximum Likelihood Methods, Convergence, Consistency and Asymptotic Distribution of Estimates, Properties and Practical Issues: Bias Distribution, Experiment Design, Model Validation.

MCT P99 Project