STUDY PLAN

For

CIVIL ENGINEERING DEPARTMENT

1-1 Civil Engineering Department:

- ***Introduction:***

In the last few decades a move steps happened in civil engineering field, so the need to design skills became from today requirements. The goal of civil engineering department in Taif University is to provide the country with engineers, experiences and knowledge concerned with civil engineering. The civil engineering department in Taif university characterized by graduating engineering in specialized majors that required in the work market in the kingdom of Saudi Arabia such as structural and construction major, highway and railway major, and environmental engineering and water major.

- ***Vision of civil engineering department:***

The civil engineering department is one of pioneers and distinct departments on national and international level through presenting programs according to the international standards and presents distinct research programs to serve country.

- ***Mission of Civil Engineering department:***

The mission of civil engineering department stems from the mission of the faculty of engineering of Taif university, to educate and graduate civil engineers fully aware with fundamental of basic sciences, applications and skills according to the international standards, quality standards and civil engineering projects requirements. These sciences include basic theories to analyze civil structures which lead to safety design for concrete structures, steel structures and water and drainage projects. As well as the civil engineer staff is representing an expert consultant house for surrounding community in the field of civil engineering.

- ***Objectives of Civil Engineering department:***

1) Good preparing to graduates in basic knowledge whether engineering, scientific or humanity with ability of engage of creativeness and analysis in the civil engineering field.
2) Preparing graduates able to use the modern technical tools in civil projects.
3) Preparing graduates able to self development and self learning to match the continuous technical changes.
4) Enhancing graduates skills through training courses and workshops.
5) Presenting graduates programs for diploma, master and PhD degree.
6) Carrying out different researches and studies to solve civil projects problems.
7) Positive participation of the department in solving environmental problems with safe and perfect scientific methods

1-2 General plan of study of the department:

- ***Levels one and Two:***

The study in the first two levels is general for all students in the faculty of engineering and aims to prepare the student for enrolling in different departments.

- ***Levels from three to eight:***

The study in these levels through six successive semesters is general for all civil engineering majors:

- ***Levels nine and ten:***

After the students end the eighth level or pass 110 credit hours they are distributed in the following majors:

1- ***Structural and Construction Engineering Major***
2- ***Highway and Railway Engineering Major***
3- ***Environmental Engineering and Water Major***

1-3 University Requirements for Bachelor Degree:

Course No.	Course title	Credit hours	Contact hours		Prerequisite	
			LEC	LB /T	Course No.	Course title
101101	Islamic culture (1)	2	2	-		
101202	Islamic culture (2)	2	2	-	101101	Islamic culture (1)
101303	Islamic culture (3)	2	2		101202	Islamic culture (2)
101404	Islamic culture (4)	2	2	-	101303	Islamic culture (3)
103101	Arabic language (1)	3	3	-		
Total		**11**	**11**	**-**		

1-4 Faculty Requirements for Bachelor Degree:

Course No.	Course title	Credit hours	Contact hours		Prerequisite	
			LEC	LB /T	Course No.	Course title
104051	English language (1)	4	3	12	-	-
104052	English language (2)	4	3	12	104051	English language (1)
203051	Physics (1)	4	3	3	-	-
203052	Physics (2)	4	3	3	203051	Physics (1)
202051	Mathematics (1)	4	3	2	-	-
202052	Mathematics (2)	4	3	2	202051	Mathematics (1)
202054	Mathematics (3)	4	3	2	202052	Mathematics (2)
202055	Statistics & probability theory	3	2	2	202052	Mathematics (2)
202053	Engineering mechanics	4	3	2	202051	Mathematics (1)
204051	Engineering chemistry	4	3	3	Approval	Approval of academic advisor
802051	Engineering drawing	2	1	3	Approval	Approval of academic advisor
803330	Computers and programming	2	1	3	Approval	Approval of academic advisor
800051	Engineering economics	2	2	-	Level	Level 4
Dept.	Summer training	2	-	-	Approval	Dept. approval
Dept.	Senior project (1)	2	1	4	Approval	Dept. approval
Dept.	Senior project (2)	2	1	4	Dept.	Senior project (1)
Total		**51**	**35**	**57**		

1-5 Study Plan for Preparatory Year (General for all Departments)

- ***First level***

Course No.	Course title	Credit hours	Contact hours		Prerequisite	
			LEC	LB /T	Course No.	Course title
103101	Arabic language (1)	3	3	-	-	-
104051	English language (1)	4	3	12	-	-
202051	Mathematics (1)	4	3	2	-	-
203051	Physics (1)	4	3	3	-	-
Total		**15**	**12**	**17**		

- ***Second level***

Course No.	Course title	Credit hours	Contact hours		Prerequisite	
			LEC	LB /T	Course No.	Course title
104052	English language (2)	4	3	12	104051	English language (1)
101101	Islamic culture (1)	2	2	-	-	-
202052	Mathematics (2)	4	3	2	202051	Mathematics (1)
802051	Engineering drawing	2	1	3	Approval	Approval of academic advisor
204051	Engineering chemistry	4	3	3	Approval	Approval of academic advisor
Total		**16**	**12**	**20**		

1-6 General Requirements of Civil Engineering Department:

The general requirements are educational courses for all civil engineering students and are shown in the following table:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801001	Civil engineering drawing	2	1	4	802051	Engineering drawing
801002	Structural analysis (1)	3	2	3	202052	Mathematics (2)
801003	Structural analysis (2)	3	2	3	801002	Structural analysis (1)
801004	Properties and strength of materials	3	2	2	203051	Physics (1)
801005	Construction materials	3	2	2	801004	Properties and strength of materials
801006	Concrete technology	3	2	2	801005	Construction materials
801007	Reinforced concrete (1)	3	2	2	801006	Concrete technology
801008	Reinforced concrete (2)	3	2	2	801007	Reinforced concrete (1)
801009	Steel structures (1)	3	2	2	801003	Structural analysis (2)
801010	Fluid mechanics	2	1	2	203052	Physics (2)
801011	Hydraulic (1)	2	1	2	801010	Fluid mechanics
801012	Surveying (1)	3	2	4	202052	Mathematics (2)
801013	Surveying (2)	3	2	4	801012	Surveying (1)
801014	Irrigation and drainage engineering	3	2	2	801010	Fluid mechanics
801015	Geology for civil engineers	2	2	-	203051	Physics (1)
801016	Geotechnical engineering	3	2	2	801015	Geology for civil engineers
801017	Foundation engineering	3	2	2	801016	Geotechnical Engineering
801018	Highways and airports engineering (1)	3	2	2	801013	Surveying (2)
801019	Transportation and traffic engineering (1)	3	2	2	801013	Surveying (2)
801020	Sanitary and environmental engineering	3	2	2	801010	Fluid mechanics
801021	Construction methods and equipments	2	2	-	801006	Concrete technology
801022	Contracts, specifications, and quantities estimation	2	1	2	804070*	Building construction
801023	Management of construction projects	3	2	2	801022	Contracts, specifications, and quantities estimation
801024	Communication skills and engineering ethics	2	2	-	Approval	Approval of academic advisor
801025	Technical reports writing	2	2	-	801022	Contracts, specifications, and quantities estimation
801026	Introduction to engineering design	3	2	2	Approval	Approval of academic advisor
804070*	Building construction	2	1	3	801001	Civil engineering drawing
803330*	Computers and programming	2	1	3	Approval	Approval of academic advisor
800051*	Engineering Economics	2	2	-	Level	Level four
101202*	Islamic culture (2)	2	2	-	101101	Islamic Culture (1)
101303*	Islamic culture (3)	2	2	-	101202	Islamic Culture (2)
202053*	Engineering mechanics	4	3	2	202051	Mathematics (1)
202054*	Mathematics (3)	4	3	2	202052	Mathematics (2)
202055*	Statistics & probability theory	3	2	2	202052	Mathematics (2)
203052*	Physics (2)	4	2	3	203051	Physics (1)
Total		**95**	**66**	**67**		

Courses from other departments

1-7 Structural and Construction Engineering Major:

1-7-1 Mandatory Courses for Structural and Construction Engineering Major:

The student in structural and construction engineering major must pass the following courses in the levels 9 and 10:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801101	Computer aided structural analysis	3	2	2	801003	Structural analysis (2)
801102	Reinforced concrete (3)	3	2	2	801008	Reinforced concrete (2)
801103	Theory of plates and shells	2	2	-	801003	Structural analysis (2)
801104	Plastic analysis and design	2	1	2	801003	Structural analysis (2)
801105	Steel structures (2)	3	2	2	801009	Steel structures (1)
801106	Dynamics of structures and earthquake engineering (1)	3	2	2	801101	Computer aided Structural analysis
801107	Inspection, maintenance and strengthening of structures	2	1	2	801006	Concrete technology
101404*	Islamic culture (4)	2	2	-	101303*	Islamic Culture (3)
Total		**20**	**14**	**12**		

* Courses from other departments

1-7-2 Elective Courses for Structural and Construction Engineering Major:

The student in structural and construction engineering Major must pass two courses from the following courses:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801151	Structural analysis (3)	3	2	2	801003	Structural analysis (2)
801152	Finite element method	3	2	2	801003	Structural analysis (2)
801153	Dynamics of structures and earthquake engineering (2)	3	2	2	801106	Dynamics of structures and earthquake engineering (1)
801154	Application topics in reinforced concrete	3	2	2	801102	Reinforced concrete (3)
801155	Concrete bridges	3	2	2	801102	Reinforced concrete (3)
801156	Advanced technology of construction materials	3	2	2	801006	Concrete technology
801157	Non-traditional concretes	3	2	2	801006	Concrete technology
801158	Deep and special foundations	3	2	2	801017	Foundation engineering
801159	Foundations on problematic soils	3	2	2	801016	Geotechnical engineering
801160	Testing of structures	3	2	2	801006	Concrete technology
801161	Steel structures (3)	3	2	2	801009	Steel structures (1)
801162	Analysis and design of brick buildings	3	2	2	801005	Construction materials
801163	Structural reliability	3	2	2	Approval	Approval of academic advisor
801164	Quality control and quality assurance of concrete structures	3	2	2	801006	Concrete technology
801165	Modern construction materials	3	2	2	801005	Construction materials
801166	Design of concrete mixes with special requirements	3	2	2	801006	Concrete technology
801167	Prestressed concrete structures	3	2	2	801102	Reinforced concrete (3)
801168	Stability of structures	3	2	2	801003	Structural analysis (2)
801169	Introduction to solid mechanics	3	2	2	801003	Structural analysis (2)
801170	Suspension and guyed structures	3	2	2	801009	Steel structures (1)
801171	Planning and inspection of structural engineering projects	3	2	2	801023	Management of construction projects
801172	Fracture mechanics of concrete	3	2	2	801004	Properties and strength of materials
801173	Creep and shrinkage of concrete	3	2	2	801006	Concrete technology

1-8 Highways and Railway Engineering Major:

1-8-1 Mandatory Courses for Highways and Railway Engineering Major:

The student in **highways and railway engineering major** must pass the following courses in levels 9 and 10:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801201	Photogrammetric surveying	2	1	2	801013	Surveying (2)
801202	Highways and airports engineering (2)	3	2	2	801018	Highways and airports engineering (1)
801203	Highway and airport Materials	2	1	2	801005	Construction materials
801204	Transportation and traffic engineering (2)	2	1	2	801019	Transportation and traffic engineering (1)
801205	Railway engineering (1)	3	2	2	801013	Surveying (2)
801206	Railway engineering (2)	3	2	2	801205	Railway engineering (1)
801207	Tunnels and network engineering	3	2	2	801016	Geotechnical engineering
101404*	Islamic culture (4)	2	2	-	101303*	Islamic culture (3)
Total		**20**	**13**	**14**		

Courses from other majors

1-8-2 Elective Courses for Highways and Railway Engineering Major:

The student in **highways and railway engineering major** must pass two courses from the following courses:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801251	Special topics in highways and railways engineering	3	2	2	Approval	Approval of academic advisor
801252	Special topics in transportation and traffic engineering	3	2	2	Approval	Approval of academic advisor
801253	Geographical information systems	3	2	2	801013	Surveying (2)
801254	Remote sensing	3	2	2	801201	Photogrammetric surveying
801255	Engineering applications of surveying	3	2	2	801013	Surveying (2)
801256	Highways construction technology	3	2	2	801018	Highways and airports engineering (1)
801257	Maintenance of highways & airports	3	2	2	801018	Highways and airports engineering (1)
801258	Transportation planning and traffic engineering	3	2	2	801019	Transportation and traffic engineering (1)
801259	Traffic management systems	3	2	2	801019	Transportation and traffic engineering (1)
801260	Computer applications of traffic and transportation	3	2	2	801019	Transportation and traffic engineering (1)
801261	Pavement design	3	2	2	801203	Highway and airport materials
801262	Advanced analysis of railway systems	3	2	2	801205	Railway engineering (1)
801263	Modern railways	3	2	2	801205	Railway engineering (1)
801264	Structural dynamics	3	2	2	801003	Structural analysis (2)
801265	Design of special foundations	3	2	2	801017	Foundation engineering
801266	Design of masonry wall structures	3	2	2	801005	Construction materials
801267	Steel bridges	3	2	2	801009	Steel structures (1)
801268	Harbors engineering and costal protection	3	2	2	801011	Hydraulic (1)
804071*	Town planning and housing	3	2	2	Approval	Approval of academic advisor

1-9 Environmental Engineering and water Major:

1-9-1 Mandatory Courses for Environmental Engineering and water Major:

The student in **environmental engineering and water major** must pass the following courses in levels 9 and 10:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801301	Hydraulic (2)	3	2	2	801011	Hydraulic (1)
801302	Water supply engineering (1)	2	1	2	801020	Sanitary and environmental engineering
801303	Design of irrigation structures (1)	3	2	2	801011	Hydraulic (1)
801304	Harbors engineering and coastal protections	2	1	2	801011	Hydraulic (1)
801305	Environmental hydraulics	2	1	2	801011	Hydraulic (1)
801306	Sanitary drainage (1)	3	2	2	801302	Water supply engineering (1)
801307	Tunnels and network engineering	3	2	2	801016	Geotechnical engineering
101404*	Islamic culture (4)	2	2	-	101303*	Islamic Culture (3)
Total		**20**	**13**	**14**		

Courses from other majors

1-9-2 Elective Courses for Environmental Engineering and water Major:

The student in **environmental engineering and water major** must pass two courses from the following courses:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801351	Hydrology of valleys	3	2	2	801014	Irrigation and drainage engineering
801352	Solid wastes	3	2	2	801020	Sanitary and environmental engineering
801353	Water supply engineering (2)	3	2	2	801302	Water supply engineering (1)
801354	Sanitary drainage (2)	3	2	2	801020	Sanitary and environmental engineering
801355	Hydrology of groundwater	3	2	2	801010	Fluid mechanics
801356	Sanitary engineering projects planning and control	3	2	2	801020	Sanitary and environmental engineering
801357	Engineering hydrology	3	2	2	801010	Fluid mechanics
801358	Water resources engineering	3	2	2	801014	Irrigation and drainage engineering
801359	Computer analysis of water structures	3	2	2	801303	Design of irrigation structures (1)
801360	Design of modern irrigation systems	3	2	2	801014	Irrigation and drainage engineering
801361	Design of harbors yards	3	2	2	801011	Hydraulic (1)
801362	Inland navigation engineering	3	2	2	801011	Hydraulic (1)
801363	Design of the navigational paths	3	2	2	801011	Hydraulic (1)
801364	Design of the harbors services constructions	3	2	2	801011	Hydraulic (1)
801365	Advanced fluid mechanics	3	2	2	801010	Fluid mechanics
801366	Air pollution	3	2	2	801020	Sanitary and environmental engineering
801367	Special topics in irrigation engineering	3	2	2	Approval	Approval of academic advisor
801368	Planning and management of water resources	3	2	2	801014	Irrigation and drainage engineering
801369	Pump stations engineering	3	2	2	801011	Hydraulic (1)
801370	Chemistry of ground water	3	2	2	204051*	Engineering chemistry
801371	Sanitary microbiology	3	2	2	Approval	Approval of academic advisor
801372	Design of irrigation structures (2)	3	2	2	801303	Design of irrigation structures (1)
801373	Special topics in environmental engineering	3	2	2	Approval	Approval of department
801374	Buildings sanitary installation	3	2	2	801020	Sanitary and environmental engineering
801375	Dams Engineering	3	2	2	801303	Design of the irrigation structures (1)

** Courses from other majors*

1-10 Study plan for Civil Engineering Department:

1-10-1 General levels (six levels) :

Third level (general):

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
203052	Physics (2)	4	3	3	203051	Physics (1)
801004	Properties and strength of materials	3	2	2	203051	Physics (1)
801026	Introduction to engineering design	3	2	2	Approval	Approval of academic advisor
801001	Civil drawing	2	1	4	802051	Engineering drawing
801015	Geology for civil engineers	2	2	-	203051	Physics (1)
101202	Islamic culture (2)	2	2	-	101101	Islamic culture (1)
Total		**16**	**12**	**11**		

Fourth level (general):

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
202053	Engineering mechanics	4	3	2	202051	Mathematics (1)
202055	Statistics & Probability Theory	3	2	2	202052	Mathematics (2)
801002	Structural analysis (1)	3	2	3	202052	Mathematics (2)
801005	Construction materials	3	2	2	801004	Properties and strength of materials
801012	Surveying (1)	3	2	4	202052	Mathematics (2)
Total		**16**	**11**	**13**		

Fifth level (general):

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
202054	Mathematics (3)	4	3	2	202052	Mathematics (2)
801003	Structural analysis (2)	3	2	3	801002	Structural analysis (1)
801006	Concrete technology	3	2	2	801005	Construction materials
801010	Fluid mechanics	2	1	2	203052	Physics (2)
803330	Computers and Programming	2	1	3	Approval	Approval of academic advisor
804070	Building construction	2	1	3	801010	Civil engineering drawing
Total		**16**	**10**	**15**		

Sixth level (general):

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801007	Reinforced concrete (1)	3	2	2	801006	Concrete technology
801013	Surveying (2)	3	2	4	801012	Surveying (1)
801014	Irrigation and drainage engineering	3	2	2	801010	Fluid mechanics
801011	Hydraulic (1)	2	1	2	801010	Fluid mechanics
801016	Geotechnical Engineering	3	2	2	801015	Geology for civil engineers
800051	Engineering economy	2	2	-	level	Fourth level
Total		**16**	**11**	**12**		

Seventh level (general):

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801008	Reinforced concrete (2)	3	2	2	801007	Reinforced concrete (1)
801009	Steel structures (1)	3	2	2	801003	Structural analysis (2)
801022	Contracts, specifications, and quantities estimation	2	1	2	804070*	Building construction
801018	Highways and airports engineering (1)	3	2	2	801013	Surveying (2)
801021	Construction methods and equipments	2	2	-	801006	Concrete technology
101303	Islamic culture (3)	2	2	-	101202	Islamic culture (2)
Total		**15**	**11**	**8**		

Eighth level (general):

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801017	Foundation engineering	3	2	2	801016	Geotechnical Engineering
801023	Management of construction projects	3	2	2	801022	Contracts, specifications, and quantities estimation.
801019	Transportation and traffic engineering (1)	3	2	2	801013	Surveying (2)
801020	Sanitary and environmental engineering	3	2	2	801010	Fluid mechanics
801024	Communication skills and engineering ethics	2	2	-	Approval	Approval of academic advisor
801025	Technical reports writing	2	2	-	801022	Contracts, specifications, and quantities estimation.
Total		**16**	**12**	**8**		

Department: Summer training (2 Credit hours)

1-10-2 *Study plan of Structural and construction Major:*

Ninth level:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801102	Reinforced concrete (3)	3	2	2	801008	Reinforced concrete (2)
801101	Computer aided structural analysis	3	2	2	801003	Structural analysis (2)
801107	Inspection, maintenance and strengthening of structures	2	1	2	801006	Concrete technology
801104	Plastic analysis and design	2	1	2	801003	Structural analysis (2)
elective	Elective course (1)	3	2	2	Approval	Approval of academic advisor
Dept.	project (1)	2	1	4	Approval	Approval of department
Total		**15**	**9**	**14**		

Tenth level:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801103	Theory of plates and shells	2	2	-	801003	Structural analysis (2)
801105	Steel structures (2)	3	2	2	801009	Steel structures (1)
101404	Islamic culture (4)	2	2	-	101303	Islamic culture (3)
801106	Dynamics of structures and earthquake engineering (1)	3	2	2	801101	Computer aided structural analysis
elective	Elective course (2)	3	2	2	Approval	Approval of academic advisor
Dept.	project (2)	2	1	4	Dept.	project (1)
Total		**15**	**11**	**10**		

1-10-3 Study plan of Highways and Railway Engineering Major:

Ninth level:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801202	Highways and airports engineering (2)	3	2	2	801018	Highways and airports engineering (1)
801201	Photogrammetric surveying	2	1	2	801013	Surveying (2)
801205	Railway engineering (1)	3	2	2	801013	Surveying (2)
801203	Highway and airport materials	2	1	2	801005	Construction materials
elective	Elective course (1)	3	2	2	Approval	Approval of academic advisor
Dept.	project (1)	2	1	4	Approval	Approval of department
Total		**15**	**9**	**14**		

Tenth level:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801204	Transportation and traffic engineering (2)	2	1	2	801019	Transportation and traffic engineering (1)
801206	Railway engineering (2)	3	2	2	801205	Railway engineering (1)
801207	Tunnels and network engineering	3	2	2	801016	Geotechnical engineering
101404	Islamic culture (4)	2	2	-	101303	Islamic culture (3)
elective	Elective course (2)	3	2	2	Approval	Approval of academic advisor
Dept.	project (2)	2	1	4	Dept.	project (1)
Total		**15**	**10**	**12**		

1-10-4 Study plan of Environmental Engineering and water Major :

Ninth level:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801301	Hydraulic (2)	3	2	2	801012	Hydraulic (1)
801302	Water supply engineering (1)	2	1	2	801020	Sanitary and environmental engineering
801303	Design of irrigation structures (1)	3	2	2	801011	Hydraulic (1)
801304	Harbors engineering and coast Protections	2	1	2	801011	Hydraulic (1)
elective	Elective course (1)	3	2	2	Approval	Approval of academic advisor
Dept.	project (1)	2	1	4	Approval	Approval of department
Total		**15**	**9**	**14**		

Tenth level:

Course No.	Course title	Credit hours	Contact Hours		Prerequisite	
			Lec.	Lb/T	Course No.	Course title
801306	Sanitary drainage (1)	3	2	2	801302	Water supply engineering (1)
801305	Environmental hydraulics	2	2	1	801011	Hydraulic (1)
801307	Tunnels and network engineering	3	2	2	801016	Geotechnical engineering
101404	Islamic culture (4)	2	2	-	101303	Islamic culture (3)
elective	Elective course (2)	3	2	2	Approval	Approval of academic advisor
Dept.	project (2)	2	1	4	Dept.	project (1)
Total		**15**	**11**	**11**		

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1-11 Syllabuses of General Courses for Civil Engineering Department:

801001 Civil Engineering Drawing (2: 1, 4) Prerequisite: 802051 Engineering Drawing
Technical definitions of civil drawing – Projection of earth works, side slopes and curves - Projection of roads and embankments - Types of retaining walls and abutments: brick, plain concrete, and reinforced concrete – Projection of arches - Structures of waterway intersections - Projection of steel structures - Projection of reinforced concrete structures.

801002 Structural Analysis (1) (3: 2,3) Prerequisite: 202052 Mathematics (2)
Principles of plane static's loads and reactions – Analysis of beams: normal forces, shear forces and bending moments – Analysis of statically determinate frames: normal forces, shear forces and bending moments – Analysis of statically determinate trusses - Influence lines for statically determine structures: beams, frames, trusses and arches.

801003 Structural Analysis (2) (3: 2,3) Prerequisite: 801002 Structural Analysis (1)
Properties of plane areas – Normal stresses – Shear stresses – Combined and principles stresses – Deformations of statically determinate structures using different methods – Buckling of columns – Analysis of statically indeterminate structures.

801004 Properties and Strength of Materials (3: 2,2) Prerequisite: 203051 physics (1)
General and mechanical properties of engineering materials – Testing of engineering materials- testing machines – Strain gauges – Static tension test – Static compression test – Bending test – Shear test – Hardness tests – Corrosion of metals.

801005 Construction Materials (3: 2,2) Prerequisite: 801004 Properties and Strength of Materials
Manufacture and properties of cement – Physical and mechanical properties of cement – Chemical composition of cement – Testing of cement – Cement replacement materials – Classification of aggregates - Properties and testing of aggregate – Properties and testing of lime and gypsum – Concrete admixtures – Tests of mixing water.

801006 Concrete Technology (3: 2,2) Prerequisite: 801005 Construction Materials
General introduction – Special types of concrete – Concrete manufactory – Properties and testing of fresh concrete - Properties and testing of hardened concrete – Concrete mix design – Quality control - Concrete durability – Non-destructive tests of concrete structures.

801007 Reinforced Concrete (1) (3: 2,2) Prerequisite: 801006 Concrete Technology
Introduction to mechanical properties of concrete and steel and compatibility between them – Load distribution on structural elements – Design of cross sections subjected to bending moments: working stress design method, ultimate limit state design method – Shear stresses – Reinforcement of beams – Design of solid slabs: one way, two way - Design of paneled beams – Design of stairs.

801008 Reinforced Concrete (2) (3: 2,2) Prerequisite: 801007 Reinforced Concrete (1)
Design of slabs: hollow block slabs, flat slabs - Design of cross sections subjected to normal forces: working stress design method, ultimate limit state design method – Design of short columns - Design of cross sections subjected to bending moments and normal forces: working stress design method, ultimate limit state design method – Design of long columns – Design of frames and their supports and reinforcement.

801009 Steel Structures (1) (3: 2,2) Prerequisite: 801003 Structural Analysis (2)
Loads and stresses – Design of tension members – Design of compression members – design of connections - design of different beam types – Design of columns and their supports connections – Wind bracing – Design of riveted and bolted connections.

801010 Fluid Mechanics (2: 1,2) Prerequisite: 203052 Physics (2)

Fluid properties– Forces in static fluids – Fluid pressure measurements - Hydrostatic forces on surfaces – Buoyancy and floating – Kinematics of fluid motion – Changing of pressure intensity and velocity – Energy law and its applications – Forces due to fluid motion – Newton's second law – Dimension analysis – Dynamic similarity – Hydraulic models.

801011 Hydraulic (1) (2: 1,2) Prerequisite: 801010 Fluid mechanics

Introduction – Open channel flow - Equations for waterway cross - Sections design - Specific energy, critical depth and water flow forces - Water surface profiles and methods of calculation - Introduction of boundary layer- Drag and lift forces on submerged objects - Flow in pipes and closed conducts – Different methods to solve pipe networks – Water pipe networks.

801012 Surveying (1) (3: 2,4) Prerequisite: 202052 Mathematics (2)

Introduction – Measurements units - Branches of surveying science - Drawing scales - Linear measurements - Surveying by linear measurements - Traverses computations and correction methods - Ordinary leveling - Kind of levels - Longitudinal leveling - Cross-section leveling - Leveling Network - Areas - Volumes - Calculations of cut and fill - Coordinates transformation - Topographic map production.

801013 Surveying (2) (3: 2,4) Prerequisite: 801012 Surveying (1)

Theodolite - Angles and directions measurement using Theodolite-Traverse network - traverses adjustment - Horizontal curves-Vertical curves - Tacheometric measurement - Surveying by tacheometric measurement - The effect of curvature and refractions on the observations - Types and source of errors - Error propagations - Theory of errors - Electronic distance measurements (EDM) – Global positioning system (GPS)

801014 Irrigation and Drainage Engineering (3: 2,2) Prerequisite: 801010 Fluid Mechanics

Introduction to irrigation and drainage engineering – Water, soil and plant relations – Plant water demands – Cultivating cycle and irrigation turns - Irrigation methods: surface irrigation, drip irrigation, sprinkler irrigation – Drainage – Drainage types – Planning of irrigation and drainage projects.

801015 Geology for Civil Engineers (2: 2,0) Prerequisite: 203051 Physics (1)

Principles of physical and structural geology – The influence of geological factors on planning and construction of civil work – Geological and geophysical exploration for structures in rocks – Natural aggregates for construction – Geological of underground openings – Evaluation of dam sites.

801016 Geotechnical Engineering (3: 2,2) Prerequisite: 801015 Geology for Civil Engineers

Soil origin - Soil as a construction material - Definitions in soil - Soil properties – Soil classification - Water in soil - Soil permeability – Distribution of stresses in soil – Soil compaction - Soil consolidation - Theory of consolidation and Terzaghi – Stability of slopes – Lateral earth pressure – Chemical tests on soil .

801017 Foundation Engineering (3: 2,2) Prerequisite: 801016 Geotechnical Engineering

Soil exploration- number and depth of boring - Methods of boring - In-situ testing of soil- water table- soil bearing capacity- Terzaghi equation and others - Bearing capacity of inclined footing – Settlement - Design of strip footing - Design of rectangular and square footing - Design of combined footing - Design of smells- Design of footing subjected to moment - Raft foundation - Pile foundation - Types of piles - Pile design- Bearing capacity of deep foundation - Pile driving - pile loading test - Design of footing on piles- Retaining walls - Sheet piles.

801018 Highway and Airport Engineering (1) (3: 2,2) Prerequisite: 801013 Surveying (2)

Job classification for roads - Planning and choosing of route – Roads economy - Determinants and characteristics of the geometrical design – sight distances – Horizontal alignment – Vertical alignment - Harmonization of planning – Elements of cross section - Planning and design of surface intersections and

free intersections - Design of urban road networks in all its elements - Safety and environmental considerations in geometrical design - Elements of airport & Airport planning - Geometrical design for Airports – Runway orientation and defining landing and takeoff positions – Aircraft characteristics – Aircraft apron layout – Design of runway including length, width, longitudinal and pavement slope – Design of Helicopters landing strip – Computer applications in the geometrical design for roads and airports.

801019 Transportation and Traffic Engineering (1) (3:2,2) Prerequisite: 801013 Surveying (2)

History of the transportation system - Transportation systems and characteristics - Transportation and society – Transportation technology & Elements of transportation systems - Movement of vehicles & flow and performance - Continuous flow - Transportation stations - Introduction to transportation demand – Traffic engineering : What is traffic engineering? - Elements of the traffic system – Traffic flow characteristics – Traffic control devices: Definition, Types and purpose of devices - Traffic safety – Roads capacity.

801020 Sanitary and Environmental Engineering (3: 2,2) Prerequisite: 801010 Fluid Mechanics

Water supply systems – Water purification systems – Design of waste water networks – Waste water Transportation and treatment systems – Design of drainage of rain networks – Sludge treatment – environment engineering.

801021 Construction Methods and Equipments (2: 2,0) Prerequisite: 801006 Concrete Technology

Introduction to methods of construction – General explanation for construction equipments in different fields – Exhaustive study of basic construction equipments – Applications and field studies – Design of wooden formworks – Some novel construction techniques for concrete structures – Erection methods for concrete bridges.

801022 Contracts, Specifications and Quantities Estimation (2: 1,2)
Prerequisite: 804070 Buildings Construction

General conditions for civil works contracts – Complete specifications of building works – Definition and methods of bill quantities - Sequence of different works items – Calculation of quantities.

801023 Management of Construction Projects (3: 2,2)
Prerequisite: 801022 Contracts, Specifications and Quantities Estimation

Basic management functions – Preliminary planning to study the sight – Management tools - Labor management – Professional ethics – Leadership and decision making elements – Relationships and responsibilities between project side directions – Management computer applications - Organization frameworks.

801024 Communication Skills and engineering ethics (2:2,0) Prerequisite: Approval of academic advisor

Communication skills - Listening skills - Enhancing listening skills – Speaking skills – Requirements of effective speaking - Primarily conditions for good speaking – Features of good speaker – Obstacles of Communication - Ethics of engineering career – Relationship between engineer and the system of engineering union – Relation between engineer and owner, contractors, and consultant – The role of engineer to serve environment and community.

801025 Technical Report Writing (2: 2, -)
Prerequisite: 801022 Contracts, Specifications and Quantities Estimation

Specifications of technical writing – Paragraphs, sentences and frame of technical writing – Expression modes in technical reports – Analysis of data – Method of writing of technical report – Studies, inspections, and tests.

801026 Introduction to Engineering Design (3: 2,2) Prerequisite: Approval of academic advisor

Engineering design and engineering approaches to solve problems – Operations and products design– Mathematical and computer aided operations modeling – Quality fundamentals – Teamwork participation– presentations and their skills – Arrangement and assessment of technical articles preparation of briefed reports about required works – Self evaluation and accompanied ethics for arrangement and time management responsibility.

804070 Buildings Construction (2: 1,3) Prerequisite: 801001 Civil Engineering Drawing

Definition of building construction concepts and main building elements – Sequence of building construction methods – Brick building – Stones building – Bearing and retaining walls – Arches lintels – Isolating of buildings – Stairs–prefabricated buildings – Training of students for reading and understanding the architectural drawings – Buildings finishing works.

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1-12 Syllabuses of Mandatory Courses for Structural and Construction Engineering Major:

801101 Computer Aided Analysis of Structures (3: 2,2) Prerequisite: 801003 Structural Analysis (2)
Mathematical models to analyze structures - Choose ideal model to analyze structures – Preparing of simple program based on models of analyzing structures – Study of some available programs to analyze structures – Stiffness matrices for one dimensional element by using finite element method – Analysis methods of structures supported on elastic supports - Applications.

801102 Reinforced Concrete (3) (3: 2,2) Prerequisite: 801102 Reinforced Concrete (2)
Tanks: design of water side sections, elevated tanks, ground and underground tanks – Halls: general layout, arches, trusses saw-tooth roofs - Prestressed concrete: introduction, losses, analysis and design of simply supported prestressed concrete beams.

801103Theory of Plates and Shells (2: 2,0) Prerequisite: 801003 Structural Analysis (2)
Theory of rectangular plates – Membrane theory for shell of revolution – Membrane theory for translation shells – Bending theory of circular cylindrical shell walls - Bending theory for shells of revolution under axisymmetric loads - Bending theory of cylindrical roofs – Buckling analysis of thin shell walls.

801104 Plastic Analysis and Design (2: 1,2) Prerequisite: 801003 Structural Analysis(2)
Plastic performance of structures – Ultimate and service analysis theory – Ultimate capacity of structural elements – Collapse loads for frames – Yield line analysis of slabs – Ductility requirements for a seismic design of structures.

801105 Steel Structures (2) (3: 2,2) Prerequisite: 801009 Steel Structures (1)
Frames – Loads and stresses in bridges – Design of girder bridges – Design of truss bridges – High-rise steel structures: structural system, loads, static analysis, floors – Analysis and design of steel structures using computer.

801106 Dynamics of Structures and Earthquake Engineering (1)
(3: 2,2) Prerequisite: 801101 Computer Aided Analysis of Structures
SDOF undamped free vibration mode - SDOF damped free vibration mode – SDOF under harmonic loading – Dynamic behaviour due to general loading – Multi degree of freedom system – Damped motion of shear buildings.

801107 Inspection, Maintenance and Strengthening of Structures (2: 1,2)
Prerequisite: 801006 Concrete Technology
Types of structures defects – Methods of structures inspection – Prepare of technical report about the inspection – Strengthening of structures – Structures maintenance and protection – Repair and protection of underground structures – Modern technology for repair of concrete structures – Repair of structures subjected to fire.

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1-13 Syllabuses of Elective Courses for Structural and Construction Engineering Major:

801151 Structural Analysis (3) (3: 2,2) Prerequisite: 801003 Structural Analysis (2)
Analysis of space frames – Analysis of space trusses – Determine of stresses in circular plates – Determine of stresses in rectangular plates – Determine of stresses in shells and domes – Analysis of structures on elastic supports –Analysis of structures by stiffness matrix method .

801152 Finite Element Method (3: 2,2) Prerequisite: 801003 Structural Analysis (2)
Assemblage of discrete elements, Elastic continua, Triangular elements for plane stress, Rectangular elements for plane stress, Transformation matrix, Assembling the structure stiffness matrix, Rectangular elements in bending, Various elements for two and three dimensional analyses.

801153 Dynamics of Structures and Earthquake Engineering (2) (3: 2,2)
Prerequisite: 801106 Dynamics of Structures and Earthquake Engineering (1)
Earthquake – Behaviour of structures subjected to earthquakes – Precautions against earthquakes in building codes – Analysis of structures subjected to earthquakes - Computer applications.

801154 Application Topics in Reinforced Concrete (3: 2,2) Prerequisite: 801102 Reinforced concrete (3)
Folded plates – Cylindrical shells – Reinforced concrete trusses – Special stairs.

801155 Concrete Bridges (3: 2,2) Prerequisite: 801102 Reinforced Concrete (3)
Types of bridges – Loads on bridges – Distribution of loads on structural elements of bridge – Splices of bridges – Bearings of bridges – Design of different types of bridges – Structural details in bridges.

801156 Advanced Technology of Construction Materials (3: 2,2)
Prerequisite: 801006 Concrete Technology
Advanced concrete technology – Advanced technology of finishing and isolation materials – Modern uses for construction materials – Miscellanies construction materials: ceramic, plastic, fibers, epoxies – Pipes of water and sanitary drainage network – Technology of repair and maintenance of construction materials– welding technology – Modern technology of non-destructive tests.

801157 Non-Traditional Concretes (3: 2,2) Prerequisite: 801006 Concrete Technology
Different types of concretes – Prestressed concrete – Precast concrete – High strength concrete – High performance concrete – Fiber concrete – Self-compacting concrete – Polymer concrete – Shotcrete concrete – Lightweight concrete – Heavy weight concrete – Mass concrete.

801158 Deep and Special Foundations (3: 2,2) Prerequisite: 801017 Foundation Engineering
Definition of pile foundations – Static and dynamic analysis of pile bearing capacity – Determination of pile capacity in field and laboratory – Types of casinos – Casinos bearing capacity and its settlement in soil – Behavior of casinos under vertical and horizontal loads.

801159 Foundation on Problematic Soils (3: 2,2) Prerequisite: 801016 Geotechnical Engineering
Properties and behaviour of swelling soil - Properties and behaviour of loose soils - Properties and behaviour of collapsible soils - Properties and behaviour of soft soils – Foundations on problematic soils.

801160 Testing of Structures (3: 2,2) Prerequisite: 801006 Concrete Technology
Aims and scope–non-destructive testing of concrete structures – Applications of non-destructive tests – reasons for using non-destructive tests – The most important non-destructive tests in concrete structures-Schmidt Hammer test - Ultrasonic Puls Velocity-Core Test-Loading Test – Concrete does not achieve design requirements – Safety reports of concrete structures.

801161 Steel Structures (3) (3: 2,2) Prerequisite: 801009 Steel structures (1)

Towers – steel-concrete composite constructions – halls – cold formed steel elements – computer aided analysis and design of steel structures.

801162 Analysis and Design of Brick Buildings (3: 2,2) Prerequisite: 801005 Construction Materials
Methods of design and specifications – Materials – Advanced construction methods – Analysis and calculation of forces in elements – Analysis and design of reinforced elements and unreinforced elements – Masonry building systems – Arching behaviour – Buildings of one floor and high rise buildings.

801163 Structural Reliability (3: 2,2) Prerequisite: Approval of academic advisor
Sources of variance: loads, materials, properties – Probabilistic distributions – Calculation of probability of survival: accurate methods, approximate methods.

801164 Quality Control and Quality Assurance in Concrete Structures (3: 2,2)
Prerequisite: 801006 Concrete Technology
Definition of quality – Total quality – Priorities of quality control – Reasons for variations in concrete quality – Statistical quality control – Frequency distribution curves – Average strength and characteristic strength – Levels of quality control – Statistical analysis of set of data – Data set distribution – Evaluation of concrete test results.

801165 Modern Construction Materials (3: 2,2) Prerequisite: 801005 construction Materials
Introduction of recent construction materials – Polymeric materials – Carbon fibers – Glass fibers – Insulation materials – Repairing and strengthening materials – Pozzolanic materials – Carbon fibers reinforcement bars.

801166 Design of Concrete Mixes with Special Requirements (3: 2,2)
Prerequisite: 801006 Concrete Technology
Introduction – Mix proportioning – Cement paste/aggregates relation – Methods of mix design – Some types of concrete mixes with special requirements – Design of high strength concrete mixes - Design of high performance concrete mixes - Design of lightweight concrete mixes - Design of flowable concrete mixes - Design of concrete with minimum slump loss - Design of massive concrete mixes.

801167 Prestressed concrete structures (3:2,2) 801102 Concrete technology
Prestressing Losses - Fully and partially pre-stressed concrete structures - Ultimate strength – Serviceability – Fiber reinforced applications - Behavior of beams pre-stressed by fiber reinforced plastic tendons - Limit state method.

801168 Stability of Structures (3:2,2) 801003 Structural Analysis (2)
Different methods of analysis, Imperfect columns, inelastic buckling - Buckling by approximate methods, Beam columns - Modified slope deflection equations - Torsional buckling of columns - Torsional flexural buckling - Buckling of plates.

801169 Introduction to solid mechanics (3:2,2) 801003 Structural analysis (2)
Vectors – Tensors - Stress tensors - Strain tensors - Constitutive equations for linear elasticity - Strain energy - Compatibility equations - Formula of elasticity problems - Variation principles and energy methods - Stress deviator - Hydrostatic stress tensors - Strain flow condition - Tresca and von misses criteria - Hencky and pandtlreuss relationships

801170 Suspension and guyed structures (3:2,2) 801009 Steel structures (1)
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.

801171 Planning and Inspection of Structural Engineering Projects (3: 2,2)
Prerequisite: 801023 Management of Construction Projects
Planning concept – Planning of structural projects by networks: CPM, precedence, Pert–bar chart–line of balance - Evaluation of performance in structural projects – Resource allocation – Project monitoring.

801172 Fracture Mechanics of Concrete (3:2,2) Prerequisite: 801004 Properties and Strength of Materials

Principles of linear elastic fracture mechanics - Principles of nonlinear fracture mechanics - Structure and fracture process of concrete - Nonlinear fracture mechanics for mode I quasi-brittle fracture - Test methods to determine mode I fracture properties for concrete - Fracture resistance curves (R-curves) for quasi-brittle materials - Fracture mechanics for other deformation modes - Application of fracture mechanics to concrete structures.

801173 Creep and Shrinkage of Concrete (3:2,2) Prerequisite: 801006 Concrete Technology

The Microstructure and hardened of portland cement paste - Probabilistic approach to deformation of concrete – Estimation of drying of concrete at different relative humidity and temperatures - Creep and shrinkage – Its measurement and modeling (experimental techniques – mathematical models) - Analysis methods of structural creep - Numerical creep analysis of structures.

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1-14 Syllabuses of Mandatory Courses of Highway and Railway Engineering Major:

801201 Photogrammetric Surveying (2: 1,2) Prerequisite: 801013 Surveying (2)

Introduction – Principles of photogrammetry – Aerial and terrestrial cameras – Vertical photographs - Geometry of the vertical photographs - Scale of the vertical photograph - Stereoscopic vision - Ground coordinates from the vertical photographs – Height and coordinates from parallax – Relief displacement on a vertical photograph – Analytical photogrammetry - Relative and absolute orientations - Planning of the flight map - Digital photogrammetry - Map production from space photographs.

801202 Highways and Airports Engineering (2) (3:2,2)
Prerequisite: 801018 Highways and Airports Engineering (1)

Construction design of the roads – Axial loads & vehicle considerations - Soil stabilization – Stresses in asphalt pavement - Construction design of asphalt pavement - Construction design of concrete pavement - Stresses in concrete pavement - Design of pavement surfaces of bridges - Pavement design of flooring factories exposed to high loads - Construction design of pavement at airports - Establishment of asphalt pavement - Establishment of concrete pavement – Drainage system - Asphalt signals and signs - Quality control systems - Computer applications in road design .

801203 Highway and Airport Materials (2:1,2) Prerequisite: 801005 Construction Materials

Material types: asphalt, aggregates and local materials - Specifications and design of the selected materials - Tests of asphalt and aggregates - Mixtures design for flexible pavement on cold and hot conditions - Design of concrete mixture for rigid pavements – Standards of resilience, tests of toughness and fatigue and quality control.

801204 Transportation and Traffic Engineering (2) (2:1,2)
Prerequisite: 801019 Transportation and Traffic Engineering (1)

Public transportation - Economics of transportation - Behavior of transportation vehicles on the roads - Intersections control - Conflict points at intersections - Intersections at different levels - Intersections capacity - Management of traffic congestion - Accidents and road safety - Parking survey - Design principals of parking spaces.

801205 Railway Engineering (1) (3:2,2) Prerequisite: 801013 Surveying (2)

Railway dynamics - Elements of geometrical planning of railway and design - Engineering design of railway - Parts and components of the railway sector - Engineering and design of railway paths - Planning and design of the stations and yards – Design systems of signals - Suburban lines and storages.

801206 Railway Engineering (2) (3:2,2) Prerequisite: 801205 Railway Engineering (1)

Theory and analysis of the railway welding and the thermal stresses - Railway maintenance - Introduction to rapid railways - Study of the metro lines and bridges in the railways - Quality control of railway track and its fixation systems - Introduction to railway without aggregate layers – Camber theory in railways – Lateral stresses in railways – Study of the dynamic model in railways - Special problems and its solutions in railways.

801207 Tunnel and Network Engineering (3:2,2) Prerequisite: 801016 Geotechnical Engineering

Tunnels classifications – Primary studies: economic aspects, geology aspects and its effects on construction of tunnels – Factors affects construction of tunnels – Analysis of loads on tunnel and surface structures – Calculation of vertical, horizontal and under loads using computer – Technical aspects and the different methods for construction of tunnels.

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1-15 Syllabuses of Elective Courses for Highway and Railway Engineering Major:

801251 Special Topics in Highways and Railways Engineering (3:2,2)
Prerequisite: Approval of academic advisor

Studies deepen of any advanced special topic in Highways and railways engineering under supervision of staff.

801252 Special Topics in Transportation Engineering and Traffic (3:2,2)
Prerequisite: Approval of academic advisor

Studies deepen of any advanced special topic in traffic and transportation engineering under supervision of staff.

801253 Geographical Information Systems (3:2,2) Prerequisite: 801013 Surveying (2)

Introduction – Principals and idea of the geographical information systems (GIS) – Types of data - Digital maps & updating, production methods and field methodology – Linking the digital images with the ground coordinates systems and the resulting accuracy - Essential considerations in design of data bases for using in GIS – Applications of GIS - Modeling of applications - Environmental studies - Software and hardware systems used in GIS .

801254 Remote Sensing (3:2,2) Prerequisite: 801201 Photogrammetric Surveying

Introduction - Principles of remote sensing – Photography air-systems - Air photo interpretation and applications - Multispectral imaging and thermal infrared - Digital images of U.S. satellites - Land sat and the French SPOT - Other remote sensing satellites - Radar imaging - Digital image processing - Computer applications.

801255 Engineering Applications of Surveying (3:2,2) Prerequisite: 801013 Surveying (2)

Constructions setting-out - Architectural photogrammetry - Deformations measurement - Monitoring of constructions movement - Applications of surveying in highway and railway (curves setting–out)- Applications of surveying in utility networks – Vertical alignment of structures.

801256 Highways Construction Technology (3:2,2)
Prerequisite: 801018 Highways and Airports Engineering (1)

Technology of embankment construction, Technology of pavement construction - Management mix stations - Lay down of asphalt mixes - Compaction of asphalt mixes - Operation and supervision of asphalt mixing station - Equipment, operation inspection, quality control - Asphalt mixture requirements – Polymers in roads - Mineral filler and other additives – Viscosity of asphalt materials - Filters - Pavements of hydraulic structures – Protection of embankments and roads.

801257 Maintenance of Highways and Airports (3:2,2)
Prerequisite: 801018 Highway and Airports Engineering (1)

Asphalt pavement defaults and assessment - Concrete pavement defaults and assessment – Evaluation tests of pavement - Methods of pavement evaluation - Road maintenance - Asphalt pavement maintenance – Concrete pavement maintenance - Maintenance of pedestrian crossing routes - Road curbs and pitching - Maintenance of unpaved roads - Maintenance of drainage systems - Maintenance of opened and covered ditches - Maintenance of surface water-drainage systems - Recycling of road pavement materials – Serious maintenance - Maintenance management systems.

801258 Transportation Planning and Traffic Engineering (3:2,2)
Prerequisite: 801019 Transportation and traffic engineering (1)

Transportation planning - Introduction to the transportation Sciences - Concepts and definitions - Time dimensions to transportation planning - Transportation models - Elements of urban transportation schemes - Database - Introduction to the predict models to the demand for transportation - Analysis of transportation demand - Analysis of traffic capacity - Design of intersections with primacy control - Traffic queues - Environmental impacts of traffic on roads - Traffic engineering : The characteristics of the vehicle , the

driver and the road - Studies of the characteristics of traffic (speed , volume, travel time, time delay) - Road capacity and level of service - Traffic signs and guidance - Traffic signal design – Design of parking spaces - Street lighting - Lighting design

801259 Traffic Management Systems (3:2,2) Prerequisite: 801019 Transportation and Traffic Engineering (1)
Introduction: Characteristics of the mass transportation methods - The characteristics of transportation services - Demand for the mass transportation – Efficient of the mass transportation - The economics of the mass transportation and tariff system - Compilation of data on mass transportation .

801260 Computer Applications of Traffic and Transportation (3:2,2)
Prerequisite: 801019Transportation and Traffic Engineering (1)
Introduction – Special programs for calibration of the transportation models - Programs to assess the demand for transportation - Wait queues programs - Programs designed of the lightly signs.

801261 Pavement Design (3:2,2) Prerequisite: 801203 Highway and Airport Materials
Pavement loads - Properties of pavement materials - Assessment of base layers . Flexible and rigid pavement design - Assessment of pavement layers - Introduction to road surface coating layer - Computer applications.

801262 Advanced Analysis of Railway Systems (3:2,2) Prerequisite: 801205 Railway Engineering (1)
Analysis of vibrations and noise in the railways - Advanced models for the maintenance of the railways using computer - Analysis of railway accidents - The use of computers in the analysis of a model railway - Advanced applications for isolated connections in the railways - Force analysis between wheel and rail in the railways - Deterioration of the wheels and the rods - Defects of the rods - Study and analysis the fatigue of the rods – Study and design of crossings constructions.

801263 Modern Railways (3:2,2) Prerequisite: 801205 Railway Engineering (1)
Design of the rapid railway lines - Design of the modern branching – Using computer in the automatic signs and the control in railways - The use of ultra - sonic in the test of the rails – Study the deterioration of railways - Railway maintenance technology and its renewals - Design of railways lines without aggregates layers .

801264 Structural Dynamics (3:2,2) Prerequisite: 801003 Structural Analysis (2)
SDOF undamped free vibration mode - SDOF damped free vibration mode – SDOF under harmonic loading – Dynamic behaviour due to general loading – Multi degree of freedom system – Damped motion of shear buildings.

801265 Design of Special Foundation (3:2,2) Prerequisite: 801017 Foundation Engineering
Advanced embankment design- Problems of the constructions on compressible soil - Problems of the constructions on the collapsible soil - Problems of the constructions on the swelling soil - advanced study for design of the piles on different types of the soil - Study of the piles subject to horizontal forces- Study of foundation subjected to vibrations.

801266 Design of Masonry Wall Structures (3:2,2) Prerequisite: 801005 Construction Materials
Introduction - development of the brick buildings - Kinds of the buildings and its elements - methods of design - materials of the buildings and its properties - groups of the buildings: Axial pressure resistance – External plane bending resistance - Shear resistance in plane - Tensile resistance in plane - constructive analysis and design of R.C. beams in bending and shear - Behavior and design of plain and R.C. walls – Walls under bending and vertical loads out of plane - Effect of height and slenderness on walls behavior.

801267 Steel Bridges (3:2,2) Prerequisite: 801009 Steel Structures (1)
Kinds of bridges and its components - floorings and loads –plate girder bridges- trusses bridges - Bracings- Foundations – Composite bridges.

801268 Harbor Engineering and Costal Protection (3:2,2) Prerequisite: 801011 Hydraulic (1)

Harbor planning and construction - Theory of periodic waves - Wave energy - Power. Refraction. Diffraction and reflection – Winds - Tides and waves - Wave-structure interaction - Wave forces on structures - Design of coastal structures - Coastal zone processes - Long shore sediment transportation - Computer applications.

804071 Town planning and housing (3: 2,2) Prerequisite: Approval of academic advisor

Planning and design of housing zones: elements, background, theory and concepts – classical and modern patterns that form these zones - basic planning units – fundamentals of land subdivision – Elements of housing projects: housing units, community services and infrastructure networks.

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1-16 Syllabuses of Mandatory Courses for Environmental and Water Engineering Major:

801301 Hydraulic (2) (3: 2,2) Prerequisite: 801011 Hydraulic (1)
Unsteady flow - Critical shear stress – Hydraulic machines - Turbines and pumps – Hydraulic hammer – Functions of hydraulic structures and safety – Energy dissipations.

801302 Water Supply Engineering (1) (2:1,2) Prerequisite: 801020 Sanitary and Environmental Eng.
Introduction – Studies of water consumption – Population studies – Calculations of potable water quantities – Water resources – Ground water – Rain water – Works of water supply –Design of water networks – Water storage tanks – Specifications of drinking water.

801303 Design of Irrigation Structures (1) (3: 2,2) Prerequisite: 801011 Hydraulic (1)
Design of different types of retaining walls – Design of bridges, aqueducts, culverts and siphons.

801304 Harbor Engineering and Coastal Protection (2:1,2) Prerequisite: 801011 Hydraulic (1)
Harbor planning and construction - Theory of periodic waves - Wave energy- refraction, diffraction and reflection of waves – Winds and tides - Wave-structure interaction - Wave forces on marine structures - Design of coastal & marine structures.

801305 Environmental Hydraulics (2: 1,2) Prerequisite: 801011 Hydraulic (1)
Introduction- hydraulics and the environment- Water resources and sources of pollution- Hydrodynamics of spread and movement of pollutants– Hydraulic equations and boundary conditions for different water regimes; water streams, rivers, lakes, river mouths – Scouring process- Hydrodynamic representations and engineering solutions for environmental problems.

801306 Sanitary Drainage (1) (3: 2,2) Prerequisite: 801302 Water Supply Engineering (1)
Sanitary drainage – Properties of liquid disposal – Determination of discharges – Planning and design of sanitary drainage network – High lift pumps and pressure lines – Supplements of drainage networks – Rain water drainage networks.

801307 Tunnel and Network Engineering (3: 2,2) Prerequisite: 801016 Geotechnical Engineering
Tunnels classifications – Primary studies: economic aspects, aspects of geology and their effects on construction of tunnels – Factors affecting tunnel constructions – Analysis of loads on tunnels and surface structures – Calculations of vertical, horizontal and subsurface loads by aid of computer – Technical aspects and different methods for tunnel construction.

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1-17 Syllabuses of Elective Courses for Environment and Water Engineering Major:

801351 Hydrology of Valleys (3:2,2) Prerequisite: 801014 Irrigation and Drainage Engineering
Geomorphologlical analysis of valleys- Studies: geomorphology, geology, valleys drainage intensity, unit hydrograph calculations- Concentration time distribution- Velocity and depth of flow- Infiltration percentage- Storm protection structures; types, design empirical formulas, hydraulic and structure design.

801352 Solid Wastes (3: 2,2) Prerequisite: 801020 Sanitary and Environmental Engineering
Sources of solid wastes – Properties of solid wastes – Collecting and conveying methods- Methods of treatment and final disposal – Recycling of solid wastes.

801353 Water Supply Engineering (2) (3: 2,2) Prerequisite: 801302 Water Supply Engineering (1)
Water purification works: mixing, coagulation & flocculation, sedimentation, filtration, disinfection – Booster stations – High lift pumps – Advanced technology for water purification.

801354 Sanitary Drainage (2) (3:2,2) 801020 Sanitary and Environmental Engineering
Different types of wastewater treatment systems - Disposal of wastewater effluents - Design of wastewater treatment plants - Waste stabilization ponds- Sludge treatment.

801355 Hydrology of Groundwater (3: 2,2) Prerequisite: 801010 Fluid Mechanics
Groundwater formation – Groundwater aquifers – Groundwater exploration - Groundwater flow - Groundwater equations – Well hydraulics - Well overlaps and scenarios - Design of well screens.

801356 Planning and Control of Sanitary Engineering Projects (3: 2,2)
Prerequisite: 801020 Sanitary and Environmental Engineering
Planning concept – Planning of sanitary engineering projects by networks: - Evaluation of performance in sanitary engineering projects – Project monitoring – Water economics- Applications of criteria analysis using computers.

801357 Engineering Hydrology (3: 2,2) Prerequisite: 801010 Fluid Mechanics
Hydrological cycle- Meteorology and rainfall intensities - Water catchments determination - Surface water; discharges, one & two dimensional flow equations, water level and discharge relations - Unit hydrograph calculations and its applications- Design of rainstorm networks.

801358 Water Resources Engineering (3: 2,2) Prerequisite: 801014 Irrigation and Drainage Engineering
Hydrological cycle and water sources and its development - Estimation of the quantitative water expected – Methods of calculations of water requirements - Water sources development - Industrial progress and its requirement of water and possible pollution of groundwater and how to reserve it - Removal of wastes and its effect on the water resources - Future of the agriculture and water projects economics.

801359 Computer Analysis of Water Structures (3: 2,2) Prerequisite: 801303 Design of Irrigation Structures (1)
Study of the theoretical models for analysis of irrigation structures and selecting most appropriate ones - Computer analysis and design of irrigation structures, pumping stations, aqueducts and tunnels.

801360 Design of modern Irrigation Systems (3: 2,2) Prerequisite: 801014 Irrigation and Drainage Engineering
Introduction – Selection of modern irrigation system- Sprinkle irrigation system :kinds, efficiency and uniformity of the distribution, planning , kinds and characteristics of the Sprinklers, the hydraulic design for the secondary and the main lines, pumping needs - Drip irrigation system: elements of the systems, droppers choice and principals of the design, the plan, net design, filters and the apparent blockage – On farm developed irrigation system: design developed channels: nets of the pipes of low the pressure, the concrete channels , pumping works and the approaches, field constructions.

801361Design of Harbor Yards (3: 2,2) Prerequisite: 801011 Hydraulic (1)

Buildings of the port – Platforms for shipping merchandise, loading containers, passengers - Storing (transit, deposition)

801362 Inland Navigation Engineering (3: 2,2) Prerequisite: 801011 Hydraulic (1)

Introduction - Inland navigation economics - Hydraulic design of channels - Navigation items- hydrodynamics of shipping - Stability of river banks and navigation capacity improving - Planning and design of inland ports - Design of locks - Environmental impact assessment.

801363 Design of Navigational Paths (3: 2,2) Prerequisite: 801011 Hydraulic (1)

Planning of the navigational paths - Hydraulic design for the navigational paths – Effect of the ship passing on the navigational paths balance - Study of transportation sedimentary and its movement on area of the navigational paths - Study of equilibrium of navigational paths sides – The methods employed in the sides fixation.

801364 Design of Harbor Services Structures (3: 2,2) Prerequisite: 801011 Hydraulic (1)

Design of transit stores - Design of permanent stores - Design refrigerating stores - Movement of transfer of the merchandise study - Design of the fanner- Design system of the navigational guidance – Administration buildings – Services buildings – Planning and design of separation and arrangement stations - Design the systems of transportations and traffic for transportation vehicles – Design the stations of the river transportations.

801365 Advanced Fluid Mechanics (3: 2,2) 801010 Fluid Mechanics

Pressure distribution inside fluids- Integrated relations for a control volume – Differential relations for a fluid particle – Dimensional analysis and similarity – Viscous flow in ducts – Boundary layer flows – Inviscid incompressible flow – Open channel flow.

801366 Air Pollution (3: 2,2) Prerequisite: 801020 Sanitary and Environmental Eng.

Introduction – Pollutants classifications - Physical and industrial pollutants sources – Chemical behavior of pollutants – Smoking fog – Meteorology and air pollution – Global influences of air pollution – Collection and analysis of ambient air – Measurement of fall dust and soils – Collection and analysis of smoke simples of ambient air – Pollutants gases: carbon monoxide, sulfur dioxide, hydrogen sulphide – Layer and oxidizers.

801367 Special Topics in Irrigation Engineering (3: 2,2) Prerequisite: Approval of academic advisor

Studies deepen of any advanced special topic in irrigation and water resources engineering under supervision of staff.

801368 Planning and Management of Water Resources (3: 2,2)
Prerequisite: 801014 Irrigation and Drainage Engineering

Planning and management of water resources principles and objectives – Economic analysis of water projects – Planning of multi-purposes water projects – Components of water projects and methods of evaluation – Analytical models and analysis systems – Risk analysis of water projects – Computer applications.

801369 Pump Stations Engineering (3: 2,2) Prerequisite: 801001 Hydraulic (1)

Pumps principles theory – Performance curves – Pump definition – Total head – Total dynamic head – Friction - Head curve system – Approximate operating head – Pumps arrangement in series and in parallel – Pump applications – Pump installation – Priming – Priming chamber – Suction side design.

801370 Groundwater Chemistry (3: 2,2) Prerequisite: 204051 Engineering Chemistry

Physical and chemical properties of groundwater – Groundwater resources – Chemical components of groundwater – Graph chart of results of chemical analysis - Factors affects the quality of groundwater – Suitability of groundwater for using: houses, agriculture and industrial.

801371 Sanitary Microbiology (3: 2,2) Prerequisite: Approval of academic advisor

Microbiology – Water biology – Explain of water analysis – Water pollutants – Water impurities: occurrence and treatment.

801372 Design of irrigation Structures (2) (3: 2,2) Prerequisite: 801303 Design of Irrigation Structures (1)

Introduction - Theory of percolation under hydraulic structures – Effect of seepage on heading-up structures- Safety of hydraulic structures – Weirs – Regulators - Locks: horizontal planning, their kinds, systems of filling and emptying,– Design of concrete dams and effects of earthquakes - Design of earth and aggregate dams and control of the seepage – Dam spillways : its kinds and design, stilling basins.

801373 Special Topics in Environmental Engineering (3: 2,2) Prerequisite: Approval of academic advisor

Studies deepen in a special topic in sanitary and environmental engineering under supervision of staff.

801374 Buildings Sanitary Installation (3: 2,2) Prerequisite: 801020 Sanitary and Environmental Engineering

Primary study of sanitary installations – Sanitary plumbing – Design of water supply and drainage of: houses buildings, administrative buildings, hospitals and factories – Fire resistance networks – Introduction to air conditioning systems.

801375 Dams Engineering (3: 2,2) Prerequisite: 801303 Design of Irrigation Structures (1)

Reservoir planning: zones of storage in reservoirs, storage capacity, sedimentation – Multipurpose reservoirs – Earth and rock fill dams: classification of dams, design of dams, design of filters, stability of slopes – Causes of failures of earth dams – Gravity dams: forces, stability requirements, elementary and practical profile, height, design methods, cracks control – Arch and buttress dams: forces, design methods – Spillways and stilling basins: types and methods of design.

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