University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Structural Engineering Department
Department Responsible for the Course	Structural Engineering Department
Course Code	STE315
Year/ Level	Third year - First Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	2	-

2. Course aims:

No.	Aim
5	Lead and Communicate the project stakeholders effectively with full planning and scheduling for construction projects; and analyze its cash flow with resource and risk management.

3. Learning Outcomes (LOs):

B3.1	Communicate effectively with Project Stakeholders and display professional and ethical responsibilities during Procurement stage.
B3.2	Define PERT method and Networks for Project Scheduling.
B4.1	Deal with Tender types and Tender preparation for construction projects.
B4.2	Treat with Cash Flow analysis thinking and Project controlling.

4. Course Contents:

No.	Topics	week
1	Planning and Scheduling of Construction Projects	1
2	Types of Networks (AON and AOA Networks) and their Applications	2
3	PERT Method	3
4	Strategy of engineering contracts	4
5	Methods of project management, Contract types and components and Contract documents	5-6
6	Tender types and Tender preparation for construction projects	7
7	Control of uncertain factors in the construction projects	9
8	Pricing policy	10
9	Preparing bill of quantities	11
10	Cash flow for construction projects	12-13
11	Time and cost control	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	B3.1, B3.2
2	Semester work (Quizzes, presentation, Portfolio)	B3.2, B4.1
3	Final Term Examination	B3.2, B4.1, B4.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	8
2	Semester work (Quizzes, presentation, Portfolio)	weekly
3	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	18%
2	Semester work (Quizzes, presentation, Portfolio)	18%
3	Final Term Examination	64 %
Total		100 %

8. List of References

No.	Reference List
1	*Hegazy, T., "Computer-Based Construction Project Management", 2002.*

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Planning and Scheduling of Construction Projects	5	B4.1
2	Types of Networks (AON and AOA Networks) and their Applications	5	B3.2
3	PERT Method	5	B3.2
4	Strategy of engineering contracts	5	B4.1
5	Methods of project management, Contract types and components and Contract documents	5	B4.1
6	Tender types and Tender preparation for construction projects	5	B4.1
7	Control of uncertain factors in the construction projects	5	B2.1, B2.2
8	Pricing policy	5	B3.1, B4.1
9	Preparing bill of quantities	5	B3.1, B4.1
10	Cash flow for construction projects	5	B4.2
11	Time and cost control	5	B4.2

Course Coordinator: Prof. Dr/ Ibrahim Ahmed Motawa – Dr/ Islam Elmasaudi

Head of Department: Prof. Dr/ Ahmed Mahmoud Youssif Mohamed

Date of Approval:

Course: Construction project management	
Program LOs	**Course LOs**
B3. Lead and Communicate effectively with multidisciplinary teams and display professional and ethical responsibilities; and contextual understanding to Manage and supervise construction project.	B3.1- Communicate effectively with Project Stakeholders and display professional and ethical responsibilities during Procurement stage. B3.2- Define PERT method and Networks for Project Scheduling.
B4. Deal with biddings, contracts and financial issues including project insurance and guarantees	B4.1- Deal with Tender types and Tender preparation for construction projects B4.2- Treat with Cash Flow analysis thinking and Project controlling.

University: Mansoura University
Faculty: Faculty of Engineering
Program: **Civil Engineering Program**

1. Basic Information

Program Title	**Civil Engineering Program**
Department offering the Program	**Irrigation and Hydraulics Dept.**
Department Responsible for the Course	**Irrigation and Hydraulics Dept.**
Course Code	**IRH 311**
Year/ Level	**Third Year-Second Semester**
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	**2**	**-**

2. Course aims:

No.	Aim
1	Master a wide range of hydraulics, hydrology and structural engineering knowledge, techniques and skills to use them in water structures projects.

3. Learning Outcomes (LOs):

No.	LOs
B1.1	Apply a full range of civil engineering concepts and techniques of hydrology and hydraulics for solving water structures problems.
B1.2	Select appropriate and sustainable technologies for construction of irrigation and hydraulics structures.
B2.1	Achieve an optimum design for retaining walls, escapes and water crossing structures.

4. Course Contents:

No.	Topics	week
1	Introduction to hydraulic structures - criteria and methods of hydraulic design and analysis	W1
2	Types of retaining wall (gravity made of bricks, stones and plain concrete) - cantilever and counterfort with reinforced concrete - Structural design of retaining walls.	W2, W3
3	Hydraulic design of water structures	W4
4	Structural design of crossing structures, culverts, siphons and aqueduct	W5, W7
5	Hydraulic design of bridges and heading up calculations	W9, W10
6	Hydraulic design of tail escapes – spillways and its functions	W11, W12
7	Introduction to hydraulic tunnels.	W13
8	Applications: planning and design as well as layout and details drawing for simple hydraulic structures project.	W14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	B1.1, B1.2, B2.1
2	Semester work (Quizzes, presentation, Portfolio)	B1.1, B1.2, B2.1
3	Final Term Examination	B1.1, B1.2, B2.1

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	**8**
2	Semester work (Quizzes, presentation, Portfolio)	**weekly**
3	Final Term Examination	**15**

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	**20 %**
2	Semester work (Quizzes, presentation, Portfolio)	**10 %**
3	Final Term Examination	**70 %**
Total		100 %

8. List of References

No.	Reference List
1	Sharma, Er Dr S K., “Irrigation Engineering and Hydraulic Structures”, S. Chand Publishing, 2017.
2	Santosh Kumar Garg, “Irrigation Engineering and Hydraulic Structures: Water Resources Engineering, Vol. II”, Khanna Publishers Pvt. Ltd, 2016.
3	Sheng-Hong Chen " Hydraulic Structures. " Springer-Verlag Berlin Heidelberg, 2015.
4	Varshney Rs. "Theory And Design of Irrigation Structures Vol 2." ISBN: 978-8185240480, Nem Chand & B, 2007

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Introduction to hydraulic structures – criteria and methods of hydraulic design and analysis	1	B1.1
2	Types of retaining walls (gravity made of bricks, stones and plain concrete), cantilever and counterfort of reinforced concrete - structural design of retaining walls.	1	B1.1, B1.2, B2.1
3	Hydraulic losses in water structures - hydraulic design of water structures	1	B1.1, B1.2
4	Structural design of crossing structures, culverts, siphons and aqueduct	1	B1.1, B1.2, B2.1
5	Hydraulic design of bridges and heading up calculations	1	B1.1, B1.2
6	Hydraulic design of tail escapes – spillways and its functions	1	B1.1, B1.2, B2.1
7	Introduction to hydraulic tunnels.	1	B1.1
8	Applications: planning and design as well as layout and details drawing for simple hydraulic structures project.	1	B1.1, B1.2, B2.1

Course Coordinator: **Assoc. Prof. Dr. Tharwat Eid Sarhan.**

Head of Department: **Assoc. Prof. Dr. Tharwat Eid Sarhan.**

Date of Approval: **/ /2021**

Course: Design of water structures 1	
Program LOs	**Course LOs**
B1. Select appropriate and sustainable technologies for construction of buildings and infrastructures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.	B1.1 Apply a full range of civil engineering concepts and techniques of hydrology and hydraulics for solving water structures problems. B1.2 Select appropriate and sustainable technologies for construction of irrigation and hydraulics structures.
B2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.	B2.1 Achieve an optimum design for retaining walls, escapes and water crossing structures.

University: Mansoura University
Faculty: Faculty of Engineering
Program: **Civil Engineering Program**

1. Basic Information

Program Title	**Civil Engineering Program**
Department offering the Program	**Irrigation and Hydraulics Dept.**
Department Responsible for the Course	**Irrigation and Hydraulics Dept.**
Course Code	**IRH 321**
Year/ Level	**Third Year-First Semester**
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	**2**	**-**

2. Course aims:

No.	Aim
6	Design different types of open channels using new building materials.

3. Learning Outcomes (LOs):

No.	LOs
C1.1	Select appropriate and sustainable technologies for analysis and construction of open channels; using either numerical techniques or physical measurements; by applying a full range of civil engineering concepts and techniques of: soil mechanics and hydraulics.
C2.1	Achieve an optimum design of erodible and non-erodible open channels.

4. Course Contents:

No.	Topics	week
1	Principles of open channels flow	W1
2	Principles of energy in open channels	W2, W3
3	Flow resistance in open channels	W4
4	Principles of momentum in open channels	W5, W6
5	Study of gradually varied flow in channels	W7, W9
6	Velocity distributions in open channels	W10
7	Design methods of erodible and non-erodible open channels	W11, W12
8	Hydraulic modeling	W13

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	C1.1
2	Semester work (Quizzes, presentation, Portfolio)	C1.1- C2.1
3	Oral Examination	C1.1
4	Final Term Examination	C1.1- C2.1

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	**8**
2	Semester work (Quizzes, presentation, Portfolio)	**weekly**
3	Oral Examination	**14**
4	Final Term Examination	**15**

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	**12 %**
2	Semester work (Quizzes, presentation, Portfolio)	**12 %**
3	Oral Examination	**12 %**
4	Final Term Examination	**64 %**
Total		100 %

8. List of References

No.	Reference List
1	Terry W. Sturm " Open Channel Hydraulics." 3rd ed. McGraw Hill, 2021.
2	Radecki-Pawlik, Artur, Stefano Pagliara, and Jan Hradecky, eds. "Open Channel Hydraulics, River Hydraulic Structures and Fluvial Geomorphology: For Engineers, Geomorphologists and Physical Geographers." CRC Press, 2018.
3	Glenn E. Moglen "Fundamentals of Open Channel Flow" CRC Press, 2015.
4	Houghtalen, R.J., Akan, A.O.H., & Hwang, N.H.C. "Fundamentals of Hydraulic Engineering Systems." 4th ed. Prentice Hall, 2011.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Principles of open channels flow.	6	C1.1
2	Principles of energy in open channels.	6	C1.1
3	Flow resistance in open channels.	6	C1.1
4	Principles of momentum in open channels.	6	C1.1
5	Study of gradually varied flow in channels.	6	C1.1
6	Velocity distributions in open channels.	6	C1.1
7	Design methods of erodible and non-erodible open channels.	6	C1.1- C2.1
8	Hydraulic modeling.	6	C1.1

Course Coordinator: **Prof. Dr. Mohsen Mohamed Ezzeldin.**

Head of Department: **Assoc. Prof. Dr. Tharwat Eid Sarhan.**

Date of Approval: **/ / 2021.**

Course: Hydraulics 2	
Program LOs	**Course LOs**
C1. Select appropriate and sustainable technologies for construction of buildings, infrastructures, and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and strength of Materials, Surveying, Soil Mechanics, Hydrology and Hydraulics.	C1.1 Select appropriate and sustainable technologies for analysis and construction of open channels; using either numerical techniques or physical measurements; by applying a full range of civil engineering concepts and techniques of: soil mechanics and hydraulics.
C2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures, Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Hydraulics, Water Resources and Harbors.	C2.1 Achieve an optimum design of erodible and non-erodible open channels.

Course Specifications: Irrigation elective 1
Advanced irrigation systems

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	**Civil Engineering Program**
Department offering the Program	**Irrigation and Hydraulics Dept.**
Department Responsible for the Course	**Irrigation and Hydraulics Dept.**
Course Code	**IRH 371**
Year/ Level	**Third Year-Second Semester**
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	**1**	**-**

2. Course aims:

No.	Aim
6	Design different types of advanced irrigation systems projects using new building materials.

3. Learning Outcomes (LOs):

No.	LOs
C1.1	Select appropriate and sustainable technologies for construction of water structures and water networks; by applying a full range of civil engineering concepts and techniques in the field of Hydrology and Hydraulics.
C6.1	Select suitable components of the irrigation network from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and withstand operational water pressures
C7.1	Select the appropriate irrigation network system according to soil, topography and climate of the agricultural area.
C7.2	Design a suitable water network for the modern irrigation systems.

4. Course Contents:

No.	Topics	week
1	Introduction to advanced irrigation systems, types and efficiencies.	W1
2	Sprinkler irrigation systems: Planning and design of network elements.	W2, W3, W4
3	Drip irrigation systems: Planning and design of network elements.	W5, W6, W7
4	Developed surface irrigation.	W9, W10
5	Design of low-pressure pipe networks.	W11, W12
6	Canal lining	W13, W14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	C1.1, C6.1, C7.1, C7.2
2	Semester work (Quizzes, presentation, Portfolio)	C1.1, C6.1, C7.1, C7.2
3	Oral Examination	C6.1, C7.1
4	Final Term Examination	C1.1, C6.1, C7.1, C7.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	**8**
2	Semester work (Quizzes, presentation, Portfolio)	**weekly**
3	Oral Examination	**14**
4	Final Term Examination	**15**

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	**15 %**
2	Semester work (Quizzes, presentation, Portfolio)	**15 %**
3	Oral Examination	**10 %**
4	Final Term Examination	**60 %**
Total		100 %

8. List of References

No.	Reference List
1	Omran, El-Sayed E., and Abdelazim M. Negm, eds. "Technological and Modern Irrigation Environment in Egypt: Best Management Practices & Evaluation." Springer Nature, 2020.
2	Megh R. Goyal, and P. Panigrahi, "Sustainable Micro Irrigation Design Systems for Agricultural Crops: Methods and Practices" CRC Press, Taylor & Francis Group, 2016.
3	Biswas, Ranajit Kumar. "Drip and Sprinkler Irrigation." New Delhi, New India Publishing Agency, 2015.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Introduction to advanced irrigation systems, types and efficiencies.	6	C1.1
2	Sprinkler irrigation systems: Planning and design of network elements.	6	C1.1, C6.1, C7.1, C7.2
3	Drip irrigation systems: Planning and design of network elements.	6	C1.1, C6.1, C7.1, C7.2
4	Developed surface irrigation.	6	C1.1, C6.1
5	Design of low-pressure pipe networks.	6	C1.1, C6.1, C7.1, C7.2
6	Canal lining	6	C1.1, C6.1

Course Coordinator: **Dr. Ahmad Mohammad Sedki Elhamrawy.**

Head of Department: **Assoc. Prof. Dr. Tharwat Eid Sarhan.**

Date of Approval: **/ /2021**

Course: Irrigation elective 1-Advanced irrigation systems	
Program LOs	**Course LOs**
C1. Select appropriate and sustainable technologies for construction of buildings, infrastructures, and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and strength of Materials, Surveying, Soil Mechanics, Hydrology and Hydraulics.	C1.1 Select appropriate and sustainable technologies for construction of water structures and water networks; by applying a full range of civil engineering concepts and techniques in the field of Hydrology and Hydraulics.
C6. Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.	C6.1 Select suitable components of the irrigation network from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and withstand operational water pressures
C7. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.	C7.1 Select the appropriate irrigation network system according to soil, topography and climate of the agricultural area. C7.2 Design a suitable water network for the modern irrigation systems.

Course Specifications: Irrigation elective 1
Hydraulic analysis of water distribution systems

University: Mansoura University
Faculty: Faculty of Engineering
Program: **Civil Engineering Program**

1. Basic Information

Program Title	**Civil Engineering Program**
Department offering the Program	**Irrigation and Hydraulics Dept.**
Department Responsible for the Course	**Irrigation and Hydraulics Dept.**
Course Code	**IRH 372**
Year/ Level	**Third Year-Second Semester**
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	**1**	**-**

2. Course aims:

No.	Aim
6	Design different types of water distribution systems including, transport and distribution systems and water networks using new building materials.

3. Learning Outcomes (LOs):

No.	LOs
C1.1	Select appropriate and sustainable technologies for analysis and construction of water control structures, water networks and pump stations; By applying a wide range of hydraulics concepts, and computer software.
C2.1	Achieve an optimum and economic design of water distribution systems, including water networks and pumping stations.
C7.1	Select adequate water control structures, water networks and pumping stations.

4. Course Contents:

No.	Topics	week
1	Water distribution systems - water needs.	W1
2	Basic principles of flow in pipes.	W2
3	Hydraulic analysis of compressed flow in networks.	W3, W4
4	Design of water transport and distribution systems - network construction	W5, W6
5	Workshops for network analysis and design using software.	W7
6	Economic analysis of networks.	W9, W10
7	Study a huge system of water through simplification methods Different.	W11
8	Rearrange existing networks with studied cases for application in different areas.	W12, W13

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	C1.1, C7.1
2	Semester work (Quizzes, presentation, Portfolio)	C1.1, C2.1, C7.1
3	Oral Examination	C1.1, C7.1
4	Final Term Examination	C1.1, C2.1, C7.1

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	**8**
2	Semester work (Quizzes, presentation, Portfolio)	**weekly**
3	Oral Examination	**14**
4	Final Term Examination	**15**

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	**15 %**
2	Semester work (Quizzes, presentation, Portfolio)	**15 %**
3	Oral Examination	**10 %**
4	Final Term Examination	**60 %**
Total		100 %

8. List of References

No.	Reference List
1	S. Masood Husain "Guidelines for Planning and Design of Piped Irrigation Networks-Part-I & II" Central Water Commission Ministry of Water Resources, River Development & Ganga Rejuvenation Government of India, 2017.
2	American Water Works Association. "Computer modeling of water distribution systems-Manual of Water Supply Practices - M32 " 3rd ed. American Water Works Association, 2012.
3	Swamee, Prabhata K., and Ashok K. Sharma. "Design of water supply pipe networks", John Wiley & Sons, 2008.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Water distribution systems - water needs.	6	C1.1
2	Basic principles of flow in pipes.	6	C1.1
3	Hydraulic analysis of compressed flow in networks.	6	C1.1
4	Design of water transport and distribution systems - network construction.	6	C1.1, C2.1, C7.1
5	Workshops for network analysis and design using software.	6	C1.1, C2.1, C7.1
6	Economic analysis of networks.	6	C2.1
7	Study a huge system of water through simplification methods Different.	6	C1.1, C2.1, C7.1
8	Rearrange existing networks with studied cases for application in different areas.	6	C1.1, C2.1, C7.1

Course Coordinator: **Assoc. Prof. Dr. Riham Mohsen Ezzeldin.** ريهام محسن عزالدين

Head of Department: **Assoc. Prof. Dr. Tharwat Eid Sarhan.**

Date of Approval: **/ / 2021.**

Course: Irrigation elective 1- Hydraulic analysis of water distribution systems	
Program LOs	**Course LOs**
C1. Select appropriate and sustainable technologies for construction of buildings, infrastructures, and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and strength of Materials, Surveying, Soil Mechanics, Hydrology and Hydraulics.	C1.1 Select appropriate and sustainable technologies for analysis and construction of water control structures, water networks and pump stations; By applying a wide range of hydraulics concepts, and computer software.
C2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures, Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Hydraulics, Water Resources and Harbors.	C2.1 Achieve an optimum and economic design of water distribution systems, including water networks and pumping stations.
C7. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.	C7.1 Select adequate water control structures, water networks and pumping stations.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	**Civil Engineering Program**
Department offering the Program	**Irrigation and Hydraulics Dept.**
Department Responsible for the Course	**Irrigation and Hydraulics Dept.**
Course Code	**IRH 373**
Year/ Level	**Third Year-Second Semester**
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	**1**	**-**

2. Course aims:

No.	Aim
6	Design different types of storm drainage networks in irrigation and hydraulics engineering, using one of the existing projects detailed study.

3. Learning Outcomes (LOs):

No.	LOs
C7.1	Select one of the existing projects detailed study for the design and analysis of storm drainage networks.
C7.2	Design storm water collection network with its different components using numerical models.
C9.1	Design the rainwater courses for protection against the erosion.
C9.2	Construct rainwater harvesting network and its applications.

4. Course Contents:

No.	Topics	week
1	Introduction	W1
2	Hydrological data for the design and analysis of storm drainage networks	W2
3	Design of network entrances	W3
4	Hydraulic analysis of networks	W4
5	Planning of rainwater harvesting facilities	W5
6	Design of rain collection ponds	W6
7	Numerical models of storm water collection networks design	W7
8	Applications and design of rainwater harvesting networks	W9
9	Study of the effects of erosion as a result of rainwater courses	W10
10	Detailed study of one of the existing projects detailed study	W11, W12
11	Study the storm water networks and the factors affecting the problems.	W13, W14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	C7.2, C9.2
2	Semester work (Quizzes, presentation, Portfolio)	C7.2, C9.1, C9.2
3	Oral Examination	C7.1, C9.2
4	Final Term Examination	C7.1, C7.2, C9.1, C9.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	**8**
2	Semester work (Quizzes, presentation, Portfolio)	**weekly**
3	Oral Examination	**14**
4	Final Term Examination	**15**

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	**15 %**
2	Semester work (Quizzes, presentation, Portfolio)	**15 %**
3	Oral Examination	**10 %**
4	Final Term Examination	**60 %**
Total		100 %

8. List of References

No.	Reference List
1	Hormoz Pazwash "Urban Storm Water Management, Second Edition" 2nd ed, CRC Press ,2016
2	Lancaster, B., "Rainwater harvesting for drylands and beyond", No. 628.11 L244r, Rain source Press, 2013.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Introduction	6	C7.1, C7.2
2	Hydrological data for the design and analysis of storm drainage networks	6	C7.2
3	Design of network entrances	6	C7.2
4	Hydraulic analysis of networks	6	C7.2
5	Planning of rainwater harvesting facilities	6	C7.2, C9.2
6	Design of rain collection ponds	6	C7.2
7	Numerical models of storm water collection networks design	6	C7.2
8	Applications and design of rainwater harvesting networks	6	C9.2
9	Study of the effects of erosion as a result of rainwater courses	6	C9.1
10	Detailed study of one of the existing projects detailed study	6	C7.1
11	Study the storm water networks and the factors affecting the problems.	6	C7.1, C9.2

Course Coordinator: **Assoc. Prof. Dr. Hossam Abd-Elaziz.**

Head of Department: **Assoc. Prof. Dr. Tharwat Eid Sarhan.**

Date of Approval: **/ /2021**

Course: Irrigation elective 1- Design of storm drainage networks	
Program LOs	**Course LOs**
C7. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.	C7.1 Select one of the existing projects detailed study for the design and analysis of storm drainage networks. C7.2 Design storm water collection network with its different components using numerical models.
C9. Design and construct structures for protection against dangers of unexpected natural events such as floods and storms.	C9.1 Design the rainwater courses for protection against the erosion. C9.2 Construct rainwater harvesting network and its applications.

1. Basic Information

Program Title	Civil Engineering Program		
Department offering the Program	Faculty Administration		
Department Responsible for the Course	Faculty Administration		
Course Code	MUR115		
Year/ Level	Third Year-Second Semester		
Specialization	University requirement		
Authorization data of course specification			
Teaching hours	**Lectures**	**Tutorial**	**Practical**
	2	0	0

2. Course aims:

No.	aim
1	Apply the code of ethics for engineers on all design processes.

3. Learning Outcomes (LOs):

No.	LOs
A3.1	Illustrate the concepts of values and ethics.
A3.2	Identify the importance of adherence to values and ethics in the engineering field.
A3.3	Describe the fundamental principles of ethics.

4. Course Contents:

No.	Topics
1	Scope, Human Values: Morals, Values and Ethics
2	Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others
3	Living Peacefully – Caring - Sharing – Honesty – Courage
4	Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character –
5	Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics
6	A balanced outlook on law, the code of ethics for engineers – NSPE guidelines - Fundamental principles.

5. Teaching and Learning Methods:

No.	Teaching Method	LOs
1	Interactive lectures (hybrid learning)	A3.1, A3.2, A3.3
2	Flipped classroom	A3.1, A3.2, A3.3

6. Teaching and Learning Methods 0f Disable Students:

No.	Teaching Method	Reason
1	Non	

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Semester work (reports)	A3.1, A3.2, A3.3
2	Final exam.	A3.1, A3.2, A3.3

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Semester work (reports)	7,12
2	Final exam.	14

7.3 Weighting of Assessment:

No.	Assessment Method	Marking	Weights
1	Semester work (reports)	15	30 %
2	Final exam.	35	70 %
Total		50	100%

8. List of References

No.	Reference List
1	***Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an engineer", Published by Pearson 2018.***
2	***The NSPE " Ethics reference guide" LEGAL@NSPE.ORG, 2018***

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	Library
3	Internet
4	Data Show System
5	Visualizer
6	Presenter

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LOs
1	Scope, Human Values: Morals, Values and Ethics	1	A3.1
2	Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others	1	A3.1, A3.2
3	Living Peacefully – Caring - Sharing – Honesty – Courage	1	A3.1, A3.2
4	Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character –	1	A3.1, A3.2
5	Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics	1	A3.2, A3.3
6	A balanced outlook on law, The code of ethics for engineers – NSPE guidelines - Fundamental principles.	1	A3.2, A3.3

Course Coordinator:

Head of Department:

Date of Approval:

Professional ethics	
Program' LOs	**Course LOs**
A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.	A3.1 Illustrate the concepts of values and ethics. A3.2 Identify the importance of adherence to values and ethics in the engineering field. A3.3 Describe the fundamental principles of ethics.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Faculty Administration
Department Responsible for the Course	Faculty Administration
Course Code	MUR 233
Year/ Level	Third Year-First Semester
Specialization	Minor
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	1	0

2. Course aims:

No.	Aim
3	Design system with reducing the environmental pollution

3. Learning Outcomes (LOs):

A2.1	Develop appropriate experimentations for water pollution control
A2.2	Conduct appropriate experimentations to reach the most appropriate solution of air pollution control
A6.1	Plan engineering projects taking in consideration its effect on environment
A6.2	Monitor implementation of engineering projects taking into consideration risk perception
A6.3	Plan engineered Systems for Solid Wastes Management

4. Course Contents:

No.	Topics	week
1	Introduction and basics of EIA	1
2	international regulations governing environmental conservation	2
3	Egyptian environmental law and other legislation related to the environment-environmental ethics and regulation-environmental impact assessment procedures	3-4
4	Classification of projects into categories according to the risk and size of projects	5
5	Requirements for providing environmental impact assessment studies	6
6	Life cycle assessment for industrial systems components	7
7	material and energy balances	9
8	the impact of projects on wildlife and rare species	10
9	regulations for gas emissions-environmental systems	11
10	risk perception	12
11	assessment and management	13
12	Water pollution control	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Semester work (Quizzes, presentation, Portfolio)	**A2.1 A2.2**
2	Final Term Examination	**A2.1 A2.2 A6.1 A6.2 A6.3**

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Semester work (Quizzes, presentation, Portfolio)	weekly
2	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Semester work (Quizzes, presentation, Portfolio)	33.33%
2	Final Term Examination	66.67%
Total		100 %

8. List of References

No.	Reference List
1	***Judith Petts, "Handbook of Environmental Impact Assessment", 2010***
2	***Baarrba Carroll, Josh Fothergill, Jo Murphy and Trevor Turpin, "Environmental Impact Assessment Handbook", 2015***

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Introduction and basics of EIA	3	**A2.1**
2	international regulations governing environmental conservation	3	**A2.1**
3	Egyptian environmental law and other legislation related to the environment-environmental ethics and regulation-environmental impact assessment procedures	3	**A2.1 A2.2**
4	Classification of projects into categories according to the risk and size of projects	3	**A2.1 A6.2**
5	Requirements for providing environmental impact assessment studies	3	**A2.1**
6	Life cycle assessment for industrial systems components	3	**A2.2**
7	material and energy balances	3	**A6.1 A6.2**
8	the impact of projects on wildlife and rare species	3	**A2.1 A6.3**
9	regulations for gas emissions-environmental systems	3	**A2.2**
10	risk perception	3	**A6.2**
11	assessment and management	3	**A2.1 A2.2 A6.1**
12	Water pollution control	3	**A2.1 A6.3**

Course Coordinator:

Head of Department: Prof. Dr.

Date of Approval:

Course: Environmental issues	
Program LOs	**Course LOs**
A2. Develop and conduct appropriate experimentation and/or simulation, analyze, and interpret data, assess, and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.	**A2.1** Develop appropriate experimentations for water pollution control **A2.2** conduct appropriate experimentations to reach the most appropriate solution of air pollution control
A6. Plan, supervise, and monitor implementation of engineering projects, taking into consideration other trades requirements new situations.	**A6.1** plan engineering projects taking into consideration its effect on environment **A6.2** monitor implementation of engineering projects taking into consideration risk perception **A6.3** Plan engineered Systems for Solid Wastes Management.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Public Works Engineering Department
Department Responsible for the Course	Public Works Engineering Department
Course Code	PWE321
Year/ Level	Third Year-First Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	4	1	

2. Course aims:

No.	Aim
1	Design different types of Highway projects such as flexible and rigid pavement using suitable techniques.

3. Learning Outcomes (LOs):

C1.1	Select appropriate technologies for construction pavements.
C1.2	Apply a full range of techniques for material selection and design.
C2.1	Achieve an optimum design of Roadways and Airports

4. Course Contents:

No.	Topics	week
1	Introduction to road and airport engineering	1-2
2	Pavement Material Characterization	3-5
3	Design of asphalt mixtures	6-7
4	Tests of asphalt mixtures	9
5	Design of horizontal and vertical curves	10
6	Traffic loads	11
7	Structure design of flexible and rigid pavements	12
8	Stresses in pavements	13
9	Selection of airport location, planning, elevation, runways, apron area.	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Semester work (Quizzes, presentation, Portfolio)	C1.2
2	Oral Examination	C1.2
3	Final Term Examination	C1.1, C1.2, C2.1

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Semester work (Quizzes, presentation, Portfolio)	weekly
2	Oral Examination	14
3	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Semester work (Quizzes, presentation, Portfolio)	26.7 %
2	Oral Examination	13.3 %
3	Final Term Examination	60.0 %
Total		100 %

8. List of References

No.	Reference List
1	E. Ray and Prithvi S. Kandhal and Freddy L. Roberts and Y. Richard Kim and Dah-Yinn Lee and Thomas W. Kennedy Brown, "Hot Mix Asphalt Materials, Mixture Design, and Construction", NCAT, 3rd edition, 2009.
2	Athanassios Nikolaides, "Highway Engineering pavement, Materials and Control of Quality", 2017.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Introduction to road and airport engineering	6	C1.1
2	Pavement Material Characterization	6	C1.2
3	Design of asphalt mixtures	6	C1.2
4	Tests of asphalt mixtures	6	C1.2
5	Design of horizontal and vertical curves	6	C2.1
6	Traffic loads	6	C2.1
7	Structure design of flexible and rigid pavements	6	C2.1
8	Stresses in pavements	6	C1.2
9	Selection of airport location, planning, elevation, runways, apron area.	6	C1.1, C1.2

Course Coordinator:

1. Sherief Masoud Ahmed El Badwy
2. Ahmed Mohamed Metwally Awad

Head of Department: Prof. Dr. Muharram Fouad Abdo Allaa El Din

Date of Approval:

Course: Highway and Airport Engineering	
Program LOs	**Course LOs**
C1. Select appropriate and sustainable technologies for construction of buildings, infrastructures, and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and strength of Materials, Surveying, Soil Mechanics, Hydrology and Hydraulics.	C1.1 Select appropriate technologies for construction pavements. C1.2 Apply a full range of techniques for material selection and design.
C2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures, Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Hydraulics, Water Resources and Harbors.	C2.1 Achieve an optimum design of Roadways and Airports

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Public work Engineering Department
Department Responsible for the Course	Public work Engineering Department
Course Code	PWE 371
Year/ Level	Third Year-Second Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	1	-

2. Course aims:

No.	Aim
6	Design different types of projects in public transportation , using new softwares and techniques .

3. Learning Outcomes (LOs):

C5.1	Evaluate The impact of Technological characteristics of public transportation systems on capacity, service quality, and cost.
C5.2	Practice the new methods for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling
C8.1	Use the definition and the role of public transportation systems .
C8.2	Evaluate the impact of Technological characteristics of public transportation systems on capacity, service quality, and cost.

4. Course Contents:

No.	Topics	week
1	The evolution of urban public transportation modes, systems and services.	1
2	The role of public transportation systems.	2
3	Various kinds of public transportation systems .	3-4
4	Technological characteristics of public transportation systems .	5-6
5	The impact of Technological characteristics of public transportation systems on capacity, service quality, and cost.	7-9
6	Current practice for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling	10-12
7	New methods for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling	13-14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Semester work (Quizzes, presentation, Portfolio)	C8.2,C5.2
2	Oral Examination	C8.1,C5.2
3	Final Term Examination	C8.2,C8.2,C5.1,C5.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Semester work (Quizzes, presentation, Portfolio)	weekly
2	Oral Examination	14
3	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Semester work (Quizzes, presentation, Portfolio)	30 %
2	Oral Examination	10 %
3	Final Term Examination	60 %
Total		100 %

8. List of References

No.	Reference List
1	***Meyer, Michael D. "Transportation planning handbook", Wiley ,2016.***
2	***"Transit Capacity and Quality of Service Manual", 3rd Edition, Transportation Research Board, 2013.***

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	The evolution of urban public transportation modes, systems and services.	6	C8.1
2	The role of public transportation systems.	6	C8.1
3	Various kinds of public transportation systems .	6	C8.1,C8.2
4	Technological characteristics of public transportation systems .	6	C8.2
5	The impact of Technological characteristics of public transportation systems on capacity, service quality, and cost.	6	C8.2,C5.1
6	Current practice for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling	6	C5.1,C5.2
7	New methods for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling	6	C5.1,C5.2

Course Coordinator:

1. El Sayed Abd El Azim Mohamed El Shewally
2. Usama Elrawy Ali Shahdah
3. Sanya Riad El Agamy Foda

Head of Department: Prof. Dr. Muharram Fouad Abdo Allaa El Din

Date of Approval:

Course: Public transport systems	
Program LOs	**Course LOs**
C5. Use the codes of practice of all civil engineering disciplines effectively and Professionally.	C5.1 Evaluate The impact of Technological characteristics of public transportation systems on capacity, service quality, and cost. C5.2 Practice the new methods for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling
C8. Define and preserve properties (lands, real estates) of individuals, communities, and institutions, through different surveying and GIS tools.	C8.1 Use the definition and the role of public transportation systems . C8.2 Evaluate the impact of Technological characteristics of public transportation systems on capacity, service quality, and cost.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Public Works engineering department
Department Responsible for the Course	Public Works engineering department
Course Code	PWE 372
Year/ Level	Third Year-Second Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	1	

2. Course aims:

No.	Aim
6	Design and assessment of different types of solid waste management systems

3. Learning Outcomes (LOs):

C8.1	Define solid waste management, Elements of solid waste management system, characteristics, components and waste sources.
C8.2	Define methods of reducing the generation of solid waste and different disposal methods.
C7.1	Design collection processes, temporary waste transfer stations, incineration plants and landfills
C7.2	Select an adequate solid waste management system by assessment of the proposed system.

4. Course Contents:

No.	Topics	week
1	General introduction to solid waste management, Elements of solid waste management system, characteristics, components and waste sources.	1-3
2	Methods of reducing the generation of solid waste, local storage of domestic solid waste	4-6
3	Design of solid waste collection processes, temporary waste transfer stations, Recycling and reuse of wastes	7-9
4	Safe disposal of waste	10
5	Incineration plants design	11
6	Landfills design	12
7	Assessment of solid waste management system	13
8	Industrial solid waste, hazardous waste	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Semester work (Quizzes, presentation, Portfolio)	C7.1
2	Oral examination	C8.2
3	Final Term Examination	C8.1, C8.2, C7.1, C7.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Semester work (Quizzes, presentation, Portfolio)	weekly
2	Oral examination	14
3	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Semester work (Quizzes, presentation, Portfolio)	30%
2	Oral examination	10%
3	Final Term Examination	60%
Total		100 %

8. List of References

No.	Reference List
1	George Tchobanoglous, F., "Handbook of Solid Waste Management, Second Edition", Kierth, 2004.
2	Wong, J. W.C., Surampalli, R. Y., Selvam, A., Tyagi, R. D., "Sustainable Solid Waste Management", American Society of Civil Engineers, 2016.

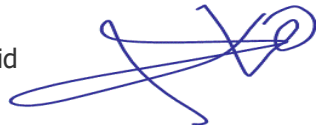
9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	General introduction to solid waste management, Elements of solid waste management system, characteristics, components and waste sources.	6	C8.1
2	Methods of reducing the generation of solid waste, local storage of domestic solid waste	6	C8.2
3	Design of solid waste collection processes, temporary waste transfer stations, Recycling and reuse of wastes	6	C8.2, C7.1
4	Safe disposal of waste	6	C8.2, C7.1
5	Incineration plants design	6	C8.2, C7.1
6	Landfills design	6	C8.2, C7.1
7	Assessment of solid waste management system	6	C7.2
8	Industrial solid waste, hazardous waste	6	C8.1

Course Coordinator:

1. Mohamed Ahmed Abd El Hakim Mosaad 
2. Hani Mahanna Shehata El Said 

Head of Department: Prof. Dr. Muharram Fouad Abdo Allaa El Din

Date of Approval:

Course: Solid waste management	
Program LOs	**Course LOs**
C8. Define and preserve properties (lands, real estates) of individuals, communities, and institutions, through different surveying and GIS tools.	C8.1 Define solid waste management, Elements of solid waste management system, characteristics, components and waste sources. C8.2 Define methods of reducing the generation of solid waste and different disposal methods.
C7. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.	C7.1 Design collection processes, temporary waste transfer stations, incineration plants and landfills. C7.2 Select an adequate solid waste management system by assessment of the proposed system.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Public Works engineering department
Department Responsible for the Course	Public Works engineering department
Course Code	PWE 373
Year/ Level	Third Year-Second Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	2	1	

2. Course aims:

No.	Aim
6	Design of different water treatment facilities using the appropriate treatment technology.

3. Learning Outcomes (LOs):

C8.1	Define different pollutants in water and advanced treatment technologies.
C8.2	Define the design criteria of treatment technologies and wastewater recycling.
C7.1	Select an adequate water treatment technology according to the constituent being treated.
C7.2	Select an adequate treatment technology for water and wastewater based on the environmental impact of each of them.

4. Course Contents:

No.	Topics	week
1	Unconventional pollutants and hazardous pollutants in water - introduction to water purification and domestic and industrial wastewaster treatment using advanced technologies.	1-3
2	Design criteria and selection of appropriate treatment technologies - adsorption process using Active carbon	4-6
3	Iron and manganese removal – Ion exchange process	7-9
4	Water hardness	10
5	Water desalination	11
6	Membrane technologies	12
7	Reuse of wastewater after treatment – Aspects and criteria of wastewater recycling	13
8	Environmentally friendly technologies for water and wastewater treatment – Anaerobic treatment	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Semester work (Quizzes, presentation, Portfolio)	C7.1
2	Oral examination	C8.1
3	Final Term Examination	C8.1, C8.2, C7.1, C7.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Semester work (Quizzes, presentation, Portfolio)	weekly
2	Oral examination	14
3	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Semester work (Quizzes, presentation, Portfolio)	30%
2	Oral examination	10%
3	Final Term Examination	60%
Total		100 %

8. List of References

No.	Reference List
1	Metcalf & Eddy, " Wastewater Engineering(Treatment, Disposal& Reuse)", Fourth Edition, Mc Graw-Hill Book Co., 2003.
2	Hussain C. M., Kharisov B., "Advanced Environmental Analysis", First Edition, Royal Society of Chemistry, 2016.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Unconventional pollutants and hazardous pollutants in water - introduction to water purification and domestic and industrial wastewaster treatment using advanced technologies.	6	C8.1
2	Design criteria and selection of appropriate treatment technologies - adsorption process using Active carbon	6	C8.2, C7.1
3	Iron and manganese removal – Ion exchange process	6	C8.2, C7.1
4	Water hardness	6	C7.1
5	Water desalination	6	C8.2, C7.1
6	Membrane technologies	6	C8.2, C7.1

7	Reuse of wastewater after treatment – Aspects and criteria of wastewater recycling	6	C8.2
8	Environmentally friendly technologies for water and wastewater treatment – Anaerobic treatment	6	C7.2

Course Coordinator:

1. Mohamed Ahmed Abd El Hakim Mosaad

2. Hani Mahanna Shehata El Said

Head of Department: Prof. Dr. Muharram Fouad Abdo Allaa El Din

Date of Approval:

Course: Advanced sanitary engineering	
Program LOs	**Course LOs**
C8. Define and preserve properties (lands, real estates) of individuals, communities, and institutions, through different surveying and GIS tools.	C8.1 Define different pollutants in water and advanced treatment technologies. C8.2 Define the design criteria of treatment technologies and wastewater recycling.
C7. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.	C7.1 Select an adequate water treatment technology according to the constituent being treated. C7.2 Select an adequate treatment technology for water and wastewater

	based on the environmental impact of each of them.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Structural Engineering Department
Department Responsible for the Course	Structural Engineering Department
Course Code	STE331
Year/ Level	Third Year- First Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	4	2	

2. Course aims:

No.	Aim
1	Master a wide range of design knowledge and techniques to use them in design of different reinforced concrete systems.

3. Learning Outcomes (LOs):

B1.1	Select appropriate system according to the given parameters.
B1.2	Applying Structural Analysis and Mechanics, Properties and Strength of Materials.
B2.1	Achieve an optimum design of different types reinforced concrete slabs, stairs and beams subjected to Torsional moment.
B2.2	Achieve an optimum design of reinforced concrete Frames, Arches, Connections and saw tooth systems.

4. Course Contents:

No.	Topics	week
1	Design of hollow block slabs (ribbed slabs) according to ECP 203	1-2
2	Design of paneled beams systems	3
3	Torsional moments and their influence on concrete structures - Design and analysis of reinforced concrete sections subjected to torsion	4
4	Design and analysis of different systems of reinforced concrete stairs	5
5	Punching shear in flat slabs - Moment transfer from flat slabs to columns - Design of flat slabs according to ECP 203.	6
6	Roofs of halls using reinforced concrete simple and continuous beams	7
7	Design of reinforced concrete frames - Design of circular concrete frames - Design of different types of hinged supports	9-10
8	Different types of reinforced concrete arches - Design of concrete arches with tie - Design of reinforced concrete circular and arched slabs	11

9	Design of concrete halls using different types of girders	12
10	Design of saw-tooth concrete slabs - Structural systems that require natural lighting - Design of different types of saw-tooth systems	13-14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	B2.1
2	Semester work (Quizzes, presentation, Portfolio)	B2.1, B2.2
3	Oral Examination	B1.1, B1.2
4	Final Term Examination	B1.1, B1.2, B2.1, B2.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	8
2	Semester work (Quizzes, presentation, Portfolio)	weekly
3	Oral Examination	14
4	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	11.43 %
2	Semester work (Quizzes, presentation, Portfolio)	17.14 %
3	Oral Examination	14.29 %
4	Final Term Examination	57.14 %
Total		100 %

8. List of References

No.	Reference List
1	Macgregor, J.G., "Reinforced Concrete Mechanics & Design", Prentice-Hall International Inc., New Jersey, USA, 2016.
2	El-behairy, S., "Reinforced Concrete Design Handbook", sixth edition, Cairo, 2019.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Design of hollow block slabs (ribbed slabs) according to ECP 203	1	B1.2, B2.1
2	Design of paneled beams systems	1	B2.1
3	Torsional moments and their influence on concrete structures - Design and analysis of reinforced concrete sections subjected to torsion	1	B2.1
4	Design and analysis of different systems of reinforced concrete stairs	1	B2.1
5	Punching shear in flat slabs - Moment transfer from flat slabs to columns - Design of flat slabs according to ECP 203.	1	B2.1
6	Roofs of halls using reinforced concrete simple and continuous beams	1	B1.1, B2.2
7	Design of reinforced concrete frames - Design of	1	B2.2

	circular concrete frames - Design of different types of hinged supports		
8	Different types of reinforced concrete arches - Design of concrete arches with tie - Design of reinforced concrete circular and arched slabs	1	B2.2
9	Design of concrete halls using different types of girders	1	B2.2
10	Design of saw-tooth concrete slabs - Structural systems that require natural lighting - Design of different types of saw-tooth systems	1	B2.2

Course Coordinator: Prof. Dr. Hamed Asker

Head of Department: Prof. Dr. Ahmed Mahmoud Yousef

Date of Approval: December 2019

Course: Reinforced Concrete 2	
Program LOs	**Course LOs**
B1. Select appropriate and sustainable technologies for construction of buildings and infrastructures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.	B1.1 Select appropriate system according to the given parameters. B1.2 Applying Structural Analysis and Mechanics, Properties and Strength of Materials.
B2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.	B2.1 Achieve an optimum design of different types reinforced concrete slabs, stairs and beams subjected to Torsional moment. B2.2 Achieve an optimum design of reinforced concrete Frames, Arches, Connections and saw tooth systems.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Structural Engineering department
Department Responsible for the Course	Structural Engineering department
Course Code	STE351
Year/ Level	Third year – Second semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	4	2	1

2. Course aims:

No.	Aim
6	Design different types of shallow foundation types according to Egyptian code of soil mechanics and foundations .

3. Learning Outcomes (ILOs):

C1.1	Apply full range of soil properties, soil stresses, foundation settlement, lateral earth pressure and stability of slopes.
C1.2	Select appropriate soil bearing capacity for shallow foundations and foundation types.

4. Course Contents:

No.	Topics	week
1	Soil types - Soil properties - Analysis of soil stresses - Foundations types	1-2
2	Foundation settlement - Soil bearing capacity for shallow foundations	3-6
3	Lateral earth pressure - Shallow foundations design under axial loads	7-9
4	Design of continuous concrete foundations – Slope stability – Design of combined concrete foundations	10-12
5	Design of continuous concrete foundations - Design of neighbor foundations	13
6	Foundations under eccentric loads - Raft foundation	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom
4	Practical

6. Teaching and Learning Methods for Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	ILOs
1	Mid Term Examination	C1.1 – C1.2
2	Semester work (Quizzes, presentation, Portfolio)	C1.1 – C1.2
3	Practical examination	C1.1
4	Oral examination	C1.1 – C1.2
5	Final Term Examination	C1.1 – C1.2

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	8
2	Semester work (Quizzes, presentation, Portfolio)	weekly
3	Practical examination	14
4	Oral examination	14
5	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	15%
2	Semester work (Quizzes, presentation, Portfolio)	15%
3	Practical examination	5%
4	Oral examination	5%
5	Final Term Examination	60%
Total		100 %

8. List of References

No.	Reference List
1	Principles of Geotechnical Engineering, 8th SI edition- Braja M. Das & Khaled Sobhan- Cengage Learning (2013)
2	Craig's Soil Mechanics, 8th edition - J. A. Knappett & R. F. Craig – Spon Press (2012)

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System
7	Soil mechanics and foundation lab

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Soil types - Soil properties - Analysis of soil stresses - Foundations types	6	C1.1 – C1.2
2	Foundation settlement - Soil bearing capacity for shallow foundations	6	C1.1 – C1.2
3	Lateral earth pressure - Shallow foundations design under axial loads	6	C1.1 – C1.2
4	Design of continuous concrete foundations – Slope stability – Design of combined concrete foundations	6	C1.1 – C1.2
5	Design of continuous concrete foundations - Design of neighbor foundations	6	C1.2
6	Foundations under eccentric loads - Raft foundation	6	C1.2

Course Coordinator:

- Ass. Prof. Ayman Ibrahim El-tahrany
- Ass. Prof. Adel Kamel Gabr

Head of Department: Prof. Dr. Ahmed Youssef

Date of Approval: August 2021

Course: Soil mechanics and foundations 1	
Program LOs	**Course LOs**
C1: Select appropriate and sustainable technologies for construction of buildings, infrastructures, and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and strength of Materials, Surveying, Soil Mechanics, Hydrology and Hydraulics	C1.1. Apply full range of soil properties, soil stresses, foundation settlement,lateral earth pressure and stability of slopes. C1.2 Select appropriate Soil bearing capacity for shallow foundations and foundation types.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering program

1. Basic Information

Program Title	Civil Engineering program		
Department offering the Program	Structural Engineering Department		
Department Responsible for the Course	Structural Engineering Department		
Course Code	ENG 245		
Year/ Level	Third Year-First Semester		
Specialization	Major		
Teaching Hours	Lectures	Tutorial	Practical
	2	1	0

2. Course aims:

No.	aim
1	Master a wide range of engineering knowledge, quality control, specification and quantity of materials to use them in building construction.

3. Learning Outcomes (LOs):

A4.1	Utilize contemporary technologies to analysis and calculate quantities of construction materials.
A4.2	Utilize safety requirements, environmental issues, and risk management principles using technical specifications.
A5	Practice research techniques to develop tables of quantities and price categories.
A6	Monitor implementation of engineering projects, taking into consideration special documents and writing contracts.

4. Course Contents:

No.	Topics	Week
1	Methods of Quantitates Calculation.	1-2
2	Analysis of the various structural items included in the construction projects - Cost elements.	3-5
3	Tables of quantities and price categories - Inventory methods of quantities of items.	6-9
4	Utilization of inventory tables, abstracts and quantity lists.	10

4	Calculation of quantities of items.	11
5	Calculation of quantities of different types of piles.	12
6	General and special documents and writing contracts.	13
7	Technical specifications (writing - elements - specifications).	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion lessons
3	Flipped classroom

6. Teaching and Learning Methods 0f Disable Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination (written)	A4.1, A4.2
2	Semester work (Formative - quizzes – presentation)	A4.2, A5
3	Final Term Examination (written)	A4.1, A4.2, A5, A6

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination (written)	8
2	Semester work (Formative - quizzes – presentation)	Weekly
3	Final Term Examination (written)	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights

1	Mid Term Examination (written)	15
2	Semester work (Formative - quizzes – presentation)	15
3	Final Term Examination (written)	70
Total		100%

8. List of References

No.	Reference List
1	Ken W. Day, James Aldred, Barry Hudson, “Concrete Mix Design, Quality Control and Specification ", 4th Edition, 2014.

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	Lab Facilities
3	White Board
4	Data Show System
5	Visualizer
6	Presenter
7	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Methods of Quantitates Calculation.	1	A4.1, A5
2	Analysis of the various structural items included in the construction projects - Cost elements.	1	A4.1, A5
3	Tables of quantities and price categories - Inventory methods of quantities of items.	1	A5, A6
4	Utilization of inventory tables, abstracts and quantity lists.	1	A5, A6
5	Calculation of quantities of items.	1	A4.1, A5, A6
6	Calculation of quantities of different types of piles.	1	A4.1, A5, A6
7	General and special documents and writing contracts.	1	A6

Course Coordinator: Prof. Dr. Mohamed Elmahdy

Head of Department: Prof. Dr. / Ahmed Mahmoud Yousef Mohamed Salem

Date of Approval:

Course: Specifications, Quantities & Quality control	
Program LOs	**Course LOs**
A.4. Utilize contemporary technologies, codes of practice, and standards, quality guidelines, health and safety requirements, environmental issues, and risk management principles.	A.4.1. Utilize contemporary technologies to analysis and calculate quantities of construction materials. A.4.2. Utilize safety requirements, environmental issues, and risk management principles using technical specifications.
A.5. Practice research techniques and methods of investigation as an inherent part of learning.	A.5. Practice research techniques to develop tables of quantities and price categories.
A.6. Plan, supervise, and monitor implementation of engineering projects, taking into consideration other trades requirements.	A.6. Monitor implementation of engineering projects, taking into consideration special documents and writing contracts.

University: Mansoura University
Faculty: Faculty of Engineering
Program: Civil Engineering Program

1. Basic Information

Program Title	Civil Engineering Program
Department offering the Program	Structural Engineering Department
Department Responsible for the Course	Structural Engineering Department
Course Code	STE341
Year/ Level	Third Year-Second Semester
Specialization	Major
Authorization data of course specification	

Teaching Hours	Lectures	Tutorial	Practical
	4	2	0

2. Course aims:

No.	Aim
1	Master a wide range of steel structures engineering knowledge and techniques to use them in steel structures projects.

3. Learning Outcomes (LOs):

B2.1	Achieve an optimum design of Steel structures.
B3.1	Address Type of steel system used in Steel Structures projects and Types of loads.
B3.2	Plan Load Path through different structural elements.
B3.3	Assess Loads and straining actions on steel system.

4. Course Contents:

No.	Topics	week
1	Types of steel structures - Types of loads acting on steel structures - Methods of design of steel structures according to the Egyptian code ECP- Calculation of forces in truss members- Design of steel members under tensile forces	1-3
2	Design of steel members under compressive forces - Design of columns subjected to axial forces- Design of welded connections – Design of bolted connections.	4-6
3	Design of steel beams under static loads	7-9
4	Design of beams carrying cranes	10
5	Design of steel frames (columns)	11
6	Design of steel frames (Rafter)	12
7	Design of column base	13
8	Design of cold formed members.	14

5. Teaching and Learning Methods:

No.	Teaching Method
1	Interactive lectures (hybrid learning)
2	Discussion Sessions
3	Flipped classroom

6. Teaching and Learning Methods for disabled Students:

No.	Teaching Method
1	Additional Tutorials
2	Online lectures and assignments

7. Student Assessment:

7.1 Student Assessment Methods:

No.	Assessment Method	LOs
1	Mid Term Examination	B2.1, B3.1, B3.2
2	Semester work (Quizzes, presentation, Portfolio)	B2.1, B3.3
3	Oral Examination	B3.1, B3.2
4	Final Term Examination	B2.1, B3.1, B3.2, B3.3

7.2 Assessment Schedule:

No.	Assessment Method	Weeks
1	Mid Term Examination	8
2	Semester work (Quizzes, presentation, Portfolio)	weekly
3	Oral Examination	14
4	Final Term Examination	15

7.3 Weighting of Assessments:

No.	Assessment Method	Weights
1	Mid Term Examination	15%
2	Semester work (Quizzes, presentation, Portfolio)	15%
3	Oral Examination	10%
4	Final Term Examination	60%
Total		100 %

8. List of References

No.	Reference List
1	*Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design (LRFD) (205) Ministerial Decree No. 359-2007, Ministry of Housing, Utilities and Urban Development.*
2	*Egyptian Code of Practice for Steel Construction and Bridges (ASD) Code No. ECP 205-2001, Edit 2009. Ministry of Housing, Utilities and Urban Development.*
3	*Alan Williams. "Steel Structures Design (ASD/LRFD)". USA: International Code Council, 2011.*

9. Facilities Required for Teaching and Learning:

No.	Facility
1	Lecture Classroom
2	White Board
3	Data Show System
4	Visualizer
5	Presenter
6	Sound System

10. Matrix of Knowledge and Skills of the Course:

No.	Topic	aim	LO's
1	Types of steel structures - Types of loads acting on steel structures - Methods of design of steel structures according to the Egyptian code ECP- Calculation of forces in truss members- Design of steel members under tensile forces	1	B3.1
2	Design of steel members under compressive forces - Design of columns subjected to axial forces- Design of welded connections – Design of bolted connections.	1	B2.1
3	Design of steel beams under static loads	1	B2.1, B3.2
4	Design of beams carrying cranes	1	B2.1, B3.3
5	Design of steel frames (columns)	1	B2.1, B3.2
6	Design of steel frames (Rafter)	1	B2.1, B3.3
7	Design of column base	1	B2.1, B3.2
8	Design of cold formed members.	1	B2.1

Course Coordinator:

Head of Department: Prof. Dr.

Date of Approval: December 2019

Course: Steel constructions 1	
Program LOs	**Course LOs**
B3. Plan and manage construction processes; address construction defects, instability, and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects.	**B3.1.** Address Type of steel system used in Steel Structures projects and Types of loads. **B3.2.** Plan Load Path through different structural elements. **B3.3.** Assess Loads and straining actions on steel system.
B2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.	**B2.1.** Achieve an optimum design of Steel structures.