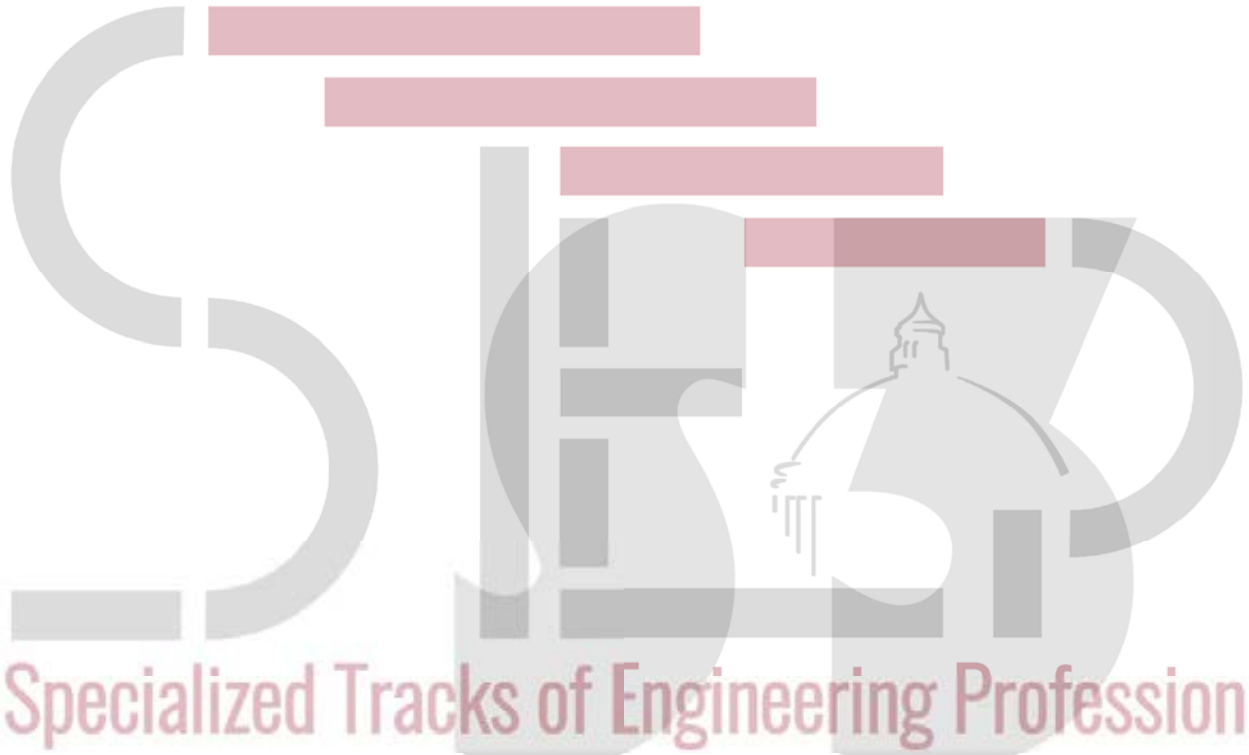

PART [C]: SPECIALIZED PROGRAMS

(3) Water Engineering and Environment Program (WEE)

برنامج هندسة المياه والبيئة

(3) Water Engineering and Environment Program (WEE)

برنامج هندسة المياه والبيئة

VISION رؤية البرنامج

Excellence and leadership in civil, water, and environmental engineering education nationally, regionally and internationally to better serve individuals, society and environment.

MISSION رسالة البرنامج

The WEE Program mission is to provide Egypt, the Arab region, and the Nile basin countries with a pool of professional engineers capable of guiding the water sector towards an Integrated Water Resources Management perspective. Such approach will attempt, on the medium and long terms to resolve diversified water problems on national, regional, and transboundary scales.

The Program aims at providing a comprehensive and superior university engineering education for graduating creative engineers. The program also aims at preparing its graduates for broad and dynamic career paths in civil engineering at large with a major specialty in environmental and water engineering. Engineering sense and multi-disciplinary vision are inherited within the character of the WEE graduates.

PROGRAM BENCHMARK مرجعية البرنامج

The WEE program has adopted the National Academic Reference Standards (NARS) for Engineering issued by the National Authority for Quality Assurance and Accreditation for Education (NAQAAE) as the program objects to ensure the satisfaction of the national quality assurance standards. The NARS 2018 for Civil engineering provide competencies that define the main characteristics and performance expected from all civil engineering students upon their graduation. This was adopted and augmented by level C competencies expected from the WEE graduate, clarified as follows.

NARS 2018	LEVEL A	LEVEL B	LEVEL C	LEVEL D
	Totally Adopted	Tota ly Adopted	As follows:	NA

WEE GRADUATE COMPETENCIES جدارات الخريج

Level A in NARS 2018	A1- Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
	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.
	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.
	A4- Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
	A5- Practice research techniques and methods of investigation as an inherent part of learning.
	A6- Plan, supervise and monitor implementation of engineering projects.
	A7- Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
	A8- Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A9- Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A10- Appreciate the ongoing need to acquire and apply new knowledge and to practice self, lifelong and other learning strategies.
Level B in NARS2018 for Civil Engineering	B1- 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 Fluid Mechanics
	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.
	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
	B4- Deal with biddings, contracts and financial issues including project insurance and guarantees.

Level C for Water Engineering and Environment	1) Comprehend the physics behind the addressed problem, apply engineering judgement to approach solutions, evaluate findings, analyze, and statistically interpret data, achieve optimum design for water control and marine structures, irrigation and drainage networks, water supply and sewage systems, and pumping stations through conducting experiments and simulations, and presenting and communicating findings effectively either graphically, verbally, or in writing using contemporary tools.
	2) Practice integrated management skills, research techniques, and methods of investigation to develop a multi-perspective multi-disciplinary approach for the design of water management systems, while considering planning, management, and safety measures in construction and retaining sustainability aspects (respecting economic, social, and environmental dimensions)
	3) Analyze and assess potential positive and adverse impacts, including environmental impacts, for projects, formulate problem solving methodologies, and produce sound management schemes for environmental aspects and risk management principles, through applying contemporary technologies, standards, and codes of practice.
	4) Adopt the basic properties of water and fundamentals of water and environment to implement the design of complex engineering projects including different flow systems, reservoirs operation, coastal and harbor engineering, irrigation networks, drainage networks, water and wastewater networks, pumping stations, and water resources management.
	5) Comprehend the hydrologic cycle and related major water quantity and quality challenges for surface and groundwater resources to be capable of formulating and solving complex engineering problems and assessing their impact on human health and well-being, social, economic, environmental, ethical, and other aspects as apropriate within the principles and contexts of sustainable design and development.
	6) Develop and implement statistical, analytical and numerical methods while understanding underlying limitations of modeling hydraulic and hydrogeological processes and apply quantitative models towards the analysis of water quantity, quality and management problems.

SPECIALIZED COURSES CONTENTS توصيف المقررات

Code	Name	Credit Hours	Pre-requisite
WEES280	Engineering Seminar	1	30 CR.HRS. + AA APROVAL
WEES281	Industrial Training-1	1	60 CR.HRS. + AA APROVAL
WEES381	Industrial Training-2	2	WEES281 + AA APROVAL
WEES481	Graduation Project-1	1	WEES381 + AA APROVAL
WEES482	Graduation Project-2	3	WEES481
Total		11	

Code	Name/Content	Credit Hours	Contact Hours						
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Specialized Requirements										
WEES280	Engineering Seminar	1	1	0						1
	Pre-requisites: 30 CHs. + AA APPROVAL									
	Talks and presentations are invited from industrial establishments relevant to the program. The guest speaker should discuss the organization, management, and recent technologies implemented in his/her industrial establishment. Students exercise writing brief technical reports on the guest presentation and deliver their own presentation about the topic. The course is graded as Pass/Fail grade-system.									
WEES281	Industrial Training-1	1	0	0						1
	Pre-requisites: 60 CR.HRS. + AA APPROVAL									
	Training on industrial establishments relevant to the program. Training lasts for total of 90 hours, during a minimum period of three weeks. The program training advisor schedules at least one follows up visit to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. *The course is graded as Pass/Fail grade-system.*									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
WEES381	Industrial Training-2	2	0	0						0
	Pre-requisites: WEES281 + AA Approval									
	Training on industrial establishments relevant to the program. Training lasts for total of 180 hours, during a minimum period of six weeks. The program training advisor schedules at least two follow-up visits to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. The course is graded as Pass/Fail grade-system.									
WEES481	Graduation Project-1	1	0	0	2					3
	Pre-requisites: 110 credits + SOPHOMORE									
	Students – in groups (or individually in some programs) - undertake a final project as part of the program. In GP1, students provide a clear identification of a real-life problem that represents an actual need for the industry or the community and reflects the mission and strategic objective of CUFE. Students are expected to survey the related literature, collect, and interpret market data, and proposed an approach for the solution, using the engineering knowledge and skills acquired. The course is graded as Pass/Fail based upon a report/oral presentation stating the expected cost and required material, tools, and facilities as well as a timed list of deliverables.									
References	Design Codes									
WEES482	Graduation Project-2	3	1	0	2	2				5
	Pre-requisites: WEES481 + AA Approval									
	Graduation Project-2 is the second phase of the graduation project. The aim is to develop innovative solutions to problems encountered during the implementation process thus fulfilling the deliverables stated in Graduation Project-1. A dissertation on the project is submitted taking into consideration technical, economic, social, and environmental requirements while analysing the major results and presenting direct conclusions.									
References	Design Codes									

PROGRAM REQUIREMENTS متطلبات البرنامج

Category		No. of courses	Course Credit Hour	Total Credit Hours
Discipline Requirements (DR)	core/ compulsory	16	3	48
		8	2	16
		1	1	1
	Elective	0	0	0
Total DR courses		22		65
Program Requirement (PR)	core/ compulsory	2	2	4
		6	3	18
		2	1	2
	Elective	0	2	0
		6	3	18
Total PR courses		14		42
Total Elective courses (DR & PR)		7	3	21

- **Discipline Requirements (DR) core/compulsory courses list**

Code	Name	Credit Hours	Pre-requiste
ARCS110	Basic Architectural Design & Building Construction	2	INTS001
ARCS216	Introduction to CAD System for Civil Engineering	2	INTS005 + INTS001
IHDS204	Civil Engineering Drawing	3	INTS001
IHDS201	Fluid Mechanics	3	PHYS001
IHDS302	Open Channel Hydraulics	3	IHDS201
INTS203	Mechanical and Electrical Systems`	2	50 credits
PBWS303	Water and Wastewater Engineering	2	IHDS201
PBWS202	Surveying for Engineers	3	MTHS003
PBWS301	Highway Engineering	2	75 credits
PBWS302	Soil Mechanics	3	STRS202 + STRS204

Code	Name	Credit Hours	Pre-requiste
PBWS402	Foundations	3	PBWS302
STRS101	Structural Analysis-1	3	EMCS001
STRS202	Structural Analysis-2	3	STRS101
STRS203	Engineering Materials	3	PHYS001 + EMCS001
STRS204	Mechanics of Materials	3	STRS203
STRS301	Reinforced Concrete Design I	3	STRS202 + STRS204
STRS302	Steel Structures Design I	3	STRS202 + STRS204
STRS303	Reinforced Concrete Design II	3	STRS301
MTHS300	Statistical Analysis for Civil Engineers	1	70 Credits
EMCS201	Engineering Mechanics 3- Rigid Body Dynamics	3	EMCS002
MTHS102	Linear Algebra and Multivariable Integrals	3	MTHS003
MTHS104	Differential Equations	3	MTHS003
MDPS001	Fundamentals of Manufacturing Engineering	2	None
STRS205	Human Resources Management	2	34 cr. Hr.
Total		**63**	**Hours**

- **Discipline Requirements (DR) elective courses list**

Code	Name	Credit Hours	Pre-requiste
ELECTIVE (E-2) 1 course (3 Credits)			
GENS341	Operation Research	3	none
GENS342	Decision Support System	3	none
Total		**3**	**Hours**

- **Program Requirements (PR) core/compulsory courses list**

Code	Name	Credit Hours	Pre-requiste
IHDS308	Prinicipals of Irrigation & Drainage	3	
IHDS309	Water Chemistry & Microbology	2	CHES001
IHDS306	Computational Water & Wastewater Networks	3	IHDS201
IHDS301	Introduction to Water Resources Engineering	3	
IHDS304	International Law of Water & Environment	1	
IHDS419	Applied Hydrolcgy	3	IHDS301
IHDS307	Introduction to Climate Change	1	
STRS415	Management of Infrastructure Projects	2	
IHDS403	Field measurments & Water Quality Aspects	3	IHDS302
IHDS402	Environmental & Municipial Hydraulics	3	IHDS309
Total		**23**	**Hours**

- **Program Requirements (PR) elective courses list**

Code	Name	Credit Hours	Pre-requiste
ELECTIVE (E-3) 1 course			
IHDS410	Participatory Irrigation Water Management	3	IHDS308
IHDS411	Water in the Arab Region and Africa	3	IHDS301
IHDS412	Non-Conventional Water Resources	3	IHDS302
IHDS413	Drainage Engineering	3	IHDS308
IHDS417	Applied Hydrology Statistics	3	MTHS005
IHDS418	Design of Pipelines and Pumping Stations	3	IHDS201
IHDS451	Computational Hydraulics	3	IHDS302
IHDS465	Integrated Waste Management	3	70-credit hours
Total		**3**	**hours**

Code	Name	Credit Hours	Pre-requiste
ELECTIVE (E-4) 1 course			
IHDS415	Non-Conventional Wastewater Treatment Systems	3	PBWS303
IHDS450	Hydrogeology	3	IHDS301
IHDS452	Optimzation Techn ques	3	MTHS102
IHDS455	Irrigation Design Works: Control Structures	3	IHDS308
PBWS441	Advanced Surveying & Digital Mapping	3	PBWS202
PBWS445	GIS and Remote Sensing Applications	3	PBWS202
PBWS446	Deep Excavation and Side Support	3	PBWS302
STRS466	Design and Construction of Water and Wastewater Structures	3	STRS301
Total		**3**	**hours**

Code	Name	Credit Hours	Pre-requiste
ELECTIVE (E-5) 1 course			
IHDS407	Irrigation Design Works Crossing Structures	3	IHDS308
IHDS409	River Engineering	3	IHDS302
IHDS401	Coastal and Harbour Engineering	3	IHDS201
IHDS404	EIA for Water, Wastewater & Irrigation Projects	3	90 Hours
IHDS405	Integrated Water Resources Management	3	IHDS301
IHDS414	Water Resources Assessment	3	IHDS301
IHDS416	Advanced Fluid Mechanics	3	IHDS201
IHDS453	Advanced River Engineering	3	IHDS409
IHDS454	Wadi Hydrology	3	IHDS419
IHDS456	Desing of Large Irrigation Structures	3	IHDS302
IHDS458	Design of Coastal Protection Works	3	IHDS401
IHDS459	Deisgn of Water and Wastewater Treatment Plants	3	PBWS303
IHDS406	On Farm Irrigation Methods	3	IHDS308
Total		**12**	**hours**

Proposed Study Plan - 8 semesters - Including Freshman Level

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	OffHr	Total
SEMESTER 1	PHYS001	Mechanical Properties of Matter and Thermodynamics	3	2		2	1				5
	MTHS002	Calculus 1	3	2	2						4
	EMCS001	Engineering Mechanics – Dynamics	3	1	2		1				4
	CHES001	Chemistry for Engineers	2	1	2						3
	INTS001	Engineering Graphics	3	2				3			5
	INTS005	Information Technology	2	1			3				4
	GENS004	Proficiency and Capacity Building	1	1							1
	GENS001	Critical and Creative Thinking	2	2							2
		Sub-Total	**19**	**13**	**6**	**2**	**4**	**3**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 2	MTHS003	Calculus 2	3	2	2						4
	EMCS002	"Engineering Mechanics - Statics	2	1	2						3
	PHYS002	Electricity and Magnetism	3	2		2	1				5
	GENS005	Elective E-A (Writing and Presentation Skills)	2	2							2
	GENS002	Societal Issues	2	2							2
	MDPS001	Fundamental of Manufacturing Engineering	2	1		1	2				4
	STRS101	Structural Anaysis – 1	3	2	2						4
	ARCS110	Basic Arch Design and Building Construction	2	1		3					4
		Sub-Total	**19**	**13**	**6**	**6**	**3**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	OffHr	Total
SEMESTER 3	MTHS104	Differential Equations	3	2	2						4
	EMCS201	Engineering Mechanics 3- Rigic Body Dynamics	3	2	2						4
	ARCS216	Inrto. To CAD System for Civil Engineering	2	1		1	2				4
	STRS202	Structural Analysis - 2	3	2	2						4
	STRS203	Engineering Material	3	2	1		2				5
	IHDS204	Civil Engineering Drawings	3	2	1		1				4
	STRS205	Human Resourses Management	2	1	2						3
		Sub-Total	**19**	**12**	**10**	**1**	**5**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 4	MTHS102	Linear Algebra and Multivariable Integrals	3	2	2						4
	IHDS201	Fluid Mechanics	3	2	2						4
	WEES280	Engineering Seminar	1	1							1
	INTS203	Mech. And Elec. Systems	2	1	2						3
	STRS204	Mechanics of Material	3	2	2						4
	PBWS202	Surveying for Engineering	3	2	0		3				5
	GENS110	Fundamental of Management, Risk and Environment	2	2							2
	GENS120	Fund. of Economics and Accounting	2	2							2
		Sub-Total	**19**	**14**	**8**	**0**	**3**	**0**	**0**	**0**	**25**

WEES281	Industrial Training -1 (Summer Training after Semester 4)	1									

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	OffHr	Total
SEMESTER 5	E-2	ELECTIVE E-2	3	2	2						4
	IHDS301	Introduction to Water Resources Engineering	3	2	2						4
	IHDS306	Computational Water & Wastewater Networks	3	2			3				5
	E-1	Elective (E-1)	2	2							2
	IHDS302	Open Channel Hydraulics	2	1		2	1				4
	STRS301	Reinforced Concrete Design - 1	3	2	2						4
	PBWS303	Water and Wastewater Engineering	2	1	2						3
	IHDS307	Introduction to Climate Change	1	1							1
		Sub-Total	**19**	**13**	**8**	**2**	**4**	**0**	**0**	**0**	**27**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 6	MTHS005	Introduction to Probability and Statistics	3	2	2						4
	PBWS302	Soil Mechanics	3	2	2						4
	STRS302	Steel Structure Design - 1	3	2	2						4
	STRS303	Reinforced Concrete Design - 2	3	2	2						4
	IHDS308	Prinicipals of Irrigation & Drainage	3	2	2						4
	IHDS309	Water Chemistry & Microbiology	2	2	2						4
	PBWS301	Highway Engineering	2	1	2						3
		Sub-Total	**19**	**13**	**14**	**0**	**0**	**0**	**0**	**0**	**27**

WEES381	Industrial Training -2 (Summer Training after Semester 6)	1									

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	OffHr	Total
SEMESTER 7	PBWS402	Foundations	3	2	2						4
	E-5	ELECTIVE E-5	3	2	2						4
	IHDS419	Applied Hydrology	3	2	2						4
	IHDS403	Field Measurments & Water Quality Aspects	3	2			2				4
	E-3	ELECTIVE E-3	3	2	2						4
	STRS415	Management of Infrastructure Projects	2	2	2						4
	WEES481	Graduation Project - 1	1			2					2
	MTHS300	Statistical Analysis for Civil Engineers	1	0	2						2
		Sub-Total	**19**	**12**	**12**	**2**	**2**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 8	E-5	ELECTIVE E-5	3	2	2						4
	E-5	ELECTIVE E-5	3	2	2						4
	IHDS402	Environmental & Municipial Hydraulics	3	2	2						4
	E-5	ELECTIVE E-5	3	2	2						4
	E-4	ELECTIVE E-4	3	2	2						4
	IHDS408	International Law of Water & Environment	1	2							2
	WEES482	Graduation Project - 2	3	1		2	2				5
		Sub-Total	**19**	**13**	**10**	**2**	**2**	**0**	**0**	**0**	**27**

COURSES CONTENTS توصيف المقررات

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Discipline Courses (Compulsory)										
ARCS110	Basic Architectural Design and Building Construction	2	1	0	3					4
	Pre-requisites: INTS001									
	Introduction to design, Design as a goal Directed Activity, The Management of Architectural Information, Architectural Design and Decision Making, Basic Elements of Architectural Design, The Architectural Design Matrix, Form and Form Generation, Space and Compositions, The Building Matrix. Building Loads, Clarifications of Construction Systems, Substructures, Insulation, Staircase Terminologies									
References	Architecture: Form, Space &Order by Francis D.K. Ching. N.Y:VNR Co.,1997, Time-Saver Standards for Interior Design and Space Flanning by Joseph DeChiara & others, The construction of Buildings, seventh edition, 1999, Barry R., Blackwell science ltd., Working Drawings Handbook, Fourth Edition, 2004, Styles K. and Bichard A., Architectural Press., Time-saver standards for Urban Design, 2003, Donald Watson, McGraw-Hill Professional, دلائل أعمال التخطيط العمراني (تقسيم الأراضي) , مركز الدراسات التخطيطية والعمرانية									
ARCS216	Introduction to CAD Systems for Civil Engineering	2	1	0	3					4
	Pre-requisites: INTS005 + INTS001									
	The aim of this course is to explore current CAD technologies and develop skills in the use of specialist CAD software to produce 2D and 3D design specifications, to transform CAD drawings into photo realistic virtual products and to gain an awareness of CAD data and how such information can be transformed to engineering drawings. At the end of the course, the students will understand a variety of terms and terminology as applied to CAD technology; demonstrate the use of an industry standard operating system to create standard CAD packages for 2D and 3D design drawings.									
References	Yasser Shoukry, Jaiprakash Pandey: Practical Autodesk AutoCAD 2021 and AutoCAD LT 2021, PUPLISHING 2020 Nighat Yasmin, Introduction to AutoCAD 2023 for Civil Engineering Applications: Learning to use AutoCAD for Civil Engineering Projects. Publisher: SDC Publications (Schroff Development Corpora, ISBN-13: 9781630575212, 2022									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MDPS001	Fundamentals of Manufacturing Engineering	2	1	0		1	2			4
	Pre-requisites: None									
	Engineering Materials - Elements of Manufacturing Processes - Casting and molding processes- metal forming processes - Shaping of plastic material - Joining processes - Metal cutting and finishing processes - Modern Manufacturing, additive manufacturing and 3D printing									
References	Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, Wiley, 2019.									
EMCS201	Engineering Mechanics 3- Rigid Body Dynamics	3	2	2	0					4
	Pre-requisites: EMCS002									
	Planar kinematics of rigid bodies- center of mass- moment of inertia - planar kinetics of rigid body: linear and angular equations – application of the equations of motion of rigid body, translation, rotation about a fixed axis, and general plane motion - Principle of Work and Kinetic Energy- Conservation of Mechanical Energy- Principle of Impulse and Momentum – Introduction to Vibrations.									
References	1- Engineering Mechanics: Dynamics and Statics, SI Edition, 14th edition. Published by Pearson (February 20th 2020) - Copyright © 2020,Russell C. Hibbeler. 2- Vector Mechanics for Engineers: Dynamics, 12th Edition, By Ferdinand Beer and E. Johnston and Phillip Cornwell and Brian Self, McGraw-Hill © 2019, Published: January 29, 2018									
MTHS102	Linear Algebra and Multivariable Integrals	3	2	2	0					4
	Pre-requisites: MTHS003									
	Solving Linear Systems, Vector Spaces and Subspaces, Inner Product Spaces and Orthonormal Bases, The Eigenvalue Problem; Diagonalization of Matrices, Computing Functions of Matrices. Functions of Several Variables, The Gradient of a Scalar Function and its Applications, Vector Fields, Curl and Divergence, Double and Triple Integrals with Applications, Line and Surface Integrals with Applications.									
References	1." .Calculus Early Transcendentals", by James Stewart, 8th edition, 2015, Cengage Learning. 2. "Elementary Linear Algebra with Applications" by B. Kolman and D. Hill, 2013, Pearson international edition.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MTHS104	Differential Equations	3	2	2	0					4
	Pre-requisites: MTHS003									
	First-order differential equations, separable, exact, linear, homogeneous and Bernoulli equations; modeling with first order differential equations; higher-order differential equations; method of undetermined coefficients; variation of parameters; modeling with higher order differential equations; series solutions; Laplace transform; properties and applications, shifting theorems, convolution theorem; solutions of differential equations using Laplace transform; Fourier series; Fourier transform.									
References	1- "A First Course in Differential Equations with Modeling Applications" 11th Edition 2017, by Dennis G. Zill 2- "Fundamentals of Differential Equations", 9th Edition, 2017, by R. Nagle , Edward Saff , Arthur Snider									
MTHS300	Statistical Analysis for Civil Engineers	1	0	2	0					2
	Pre-requisites: 70 Credit Hours									
	Review of main probability and statistical concepts. Observed data and graphical representation. Samples and Statistics. Parameter estimation; Quality Criteria for Estimates. Hypothesis Testing. Chi-Squared Goodness-of-Fit Test, Kolmogorov–Smirnov Test. Simple linear regression. Multiple linear regression. Introduction to design of experiments, statistical distribution application in engineering.									
References	Soong, T. T. (2005). Fundamentals of Introduction to Probability and Statistics for Engineers. John Wiley and Sons.									
IHDS204	Civil Engineering Drawings	3	2	1	1					4
	Pre-requisites: INTS001									
	Introduction to civil engineering projects, General Concepts, Legend and symbols, Scales and drawing size, General layout and plans, Longitudinal and cross sections, Detailing, Earthworks and retaining walls, Applications on irrigation and land reclamation projects, Half-earth-removed views, Pitching and protection. Drawing of steel sections and connections, reinforced concrete sections. Projection of beams and columns.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS201	Fluid Mechanics	3	2	0	1	1				4
	Pre-requisites: PHYS001									
	Introduction, Dimensions and units, Fluid properties (density, specific weight, specific gravity, specific heat, vapor pressure, compressibility, viscosity, surface tension), Fluid Statics (absolute and gage pressure, pressure at a point, pressure transmit ion , pressure measurements, pressure prism, hydrostatic force on a plane surface, hydrostatic force on a curved surface, buoyancy, flotation, and stability), Rigid body motion of a fluid, Fluid Kinematics (continuity equation, steady and unsteady flow, laminar and turbulent flows, path line and stream line, ideal and real, rotational and ir-rotational flow, Fluid Dynamics (Bernoulli's Equation, total and hydraulic gradient lines, application of Bernoulli Equation, Pitot Tube, stagnation point, Venturi Meter, orifice, nozzles, flow over notches and weirs), Momentum analysis of flow Systems (conservation of momentum, control volume, forces on control volume, forces acting on plates, turbines concept, forces acting on bends & reducers , calculations of minor losses), Flow through pipe lines (Reynold's Number, Darcy-Weisbach Equation, friction head losses, Moody Charts, design of pipe flow system, branching pipe, pipes in series and in parallel, head loss problems, discharge problems, sizing problem, reservoir system).									
References	Applied Fluid Mechanics 7th edition, by Robert L. Mott published by Pearson Education (2014) Foundementals of Fluid Mechanics book 7th edition by Munson Published by Wiley (2012).									
IHDS302	Open Channel Hydraulics	2	1		2	1				4
	Pre-requisites: IHDS201									
	Introduction, Types of cross sections, Stage and depth measurements, Types of flow, Velocity distribution, Velocity measurements, Kinetic energy and momentum, correction factors, Curvilinear pressure distribution, Steady uniform flow, Resistance to flow, Design of cross sections, Design of circular cross sections, Specific energy and critical flow, Applications on specific energy, Specific force, Steady rapidly varied flow, Hydraulic Jump, Weirs, Discharge measurements, Steady gradually varied flow, Water surface profiles, Computation of water surface profiles length, Flow control, Laboratory experiments.									
Textbook	Chaudhry, M. H. (2022). Open-channel flow. 3rd edition, New York: Springer									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
INTS203	Mechanical and Electrical Systems	2	1	2	0					4
	Pre-requisites: 50 CHs.									
	Introduction to electrical circuits; Electrical installation in residential and industrial buildings (illumination networks in rural areas, data lines, telephone lines & antenna, control of air conditioning, lift); Requirements of audio systems; Alarm devices (fire - security - gas); HVAC components and systems; Plumbing elements and features; Essential mechanical systems used in residential & institutional projects.									
References	"Electrical Energy Conversion and transport- An Interactive Computer-Based Approach", 2nd edition Authors "George G. Karady Keith E. Holbert"									
PBWS303	Water asnd Wastewater Engineering	2	1	2	0					4
	Pre-requisites: IHDN201									
	Introduction – Definitions – Fields of Environmental Engineering – Environmental system – Waste cycles – Main Environmental problems – Global problems – Water pollution – Water supply Engineering – Water purification works – Water distribution system and Storage tanks – Sanitary Drainage – Sewerage System – Wastewater Treatment Works.									
References	John C. Crittenden, R. Rhodes Trussell, David W. Hand, Kerry J. Howe and George Tchobanoglous (2012), MWH's Water Treatment: Principles and Design, 3rd Edition. Metcalf & Eddy Inc., George Tchobanoglous, Franklin L. Burton, Ryujiro Tsuchihashi, and H. David Stensel. 2013. Wastewater Engineering: Treatment and Resource Recovery. 5th ed. New York, NY: McGraw-Hill.									
PBWS202	Surveying for Engineers	3	2	1	2					4
	Pre-requisites: MTHS003									
	Engineering principles and applications of surveying sciences (with emphasis on plane surveying) are presented in relation to engineering. Popular techniques and engineering use of distance, angles and height difference measurements are studied and practiced. Applications in detail mapping, earthwork computations, and setting out engineering structures are covered in this course. Integrated digital surveying and mapping using total station are introduced.									
References	Charels D. Ghilani and Paul R. Wolf 2012 "Elementary surveying; an introduction to geomatics" (Thirteenth edition) Pearson Prentice Hall New Jersey., William Irvine and Finlay Maclennan 2006 "Surveying for Construction" (Fifth edition) McGraw-Hill Education.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
PBWS301	Highway Engineering	2	1	2	0					4
	Pre-requisites: 75 CHs.									
	Introduction to transport planning and traffic engineering – route study and reconnaissance – functional classification of road network – criteria of geometric design – design of road horizontal & vertical alignments – cross section elements – type of road pavement – vehicle – load and stresses – construction equipments – method statement & quality control – pavement management and rehabilitation – traffic control during road construction and maintenance. Use of computer simulation for selection of equipment.									
References	Highway Engineering and Pavement Design, Essential Books (Text Books): "Traffic and Highway Engineering" by N. J. Garber and L. A. Hoel, Recommended Books: Pavement Design and Analysis" by L. Huang, Periodicals,									
PBWS302	Soil Mechanics	3	2	2	0					4
	Pre-requisites: STRS202, STRS204									
	Basic properties of soil, Soil classification, Compaction, Permeability, Soil stresses, Consolidation, Shear strength, and Lateral earth pressure.									
References	Das, B.M. (2020), "Introduction to Geotechnical Engineering," Thomson Learning, Toronto, Ontario, Canada,									
PBWS402	Foundations	3	2	2	0					4
	Pre-requisites: PBWS302									
	Basics of soil investigations, Soil bearing capacity, Designs of shallow foundations: wall footings, isolated footings, combined footings and strip footings, Design of retaining walls, Design of deep foundations: pile construction methods, estimation of pile bearing capacity, pile load tests, design of group piles. Considerations for selection of types of foundations.									
References	Das, B.M. (2020). "Principles of Foundation Engineering", 10th Edition, Cengage Learning, Hampshire, UK Egyptian Code of Practice for Soil Mechanics and Design and Construction of Foundations (2001), ASTM International (Formerly known as: American Society for Testing and Materials).									
STRS101	Structure Analysis -1	3	2	2	0					4
	Pre-requisites: EMCS001									
	Types of structures and idealized models. Loads; supports and reactions. Internal forces in plane and space structures. Analysis of statically determinate structures such as beams, frames, and trusses. Influence lines of beams and frames.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS202	Structure Analysis -2	3	2	2	0					4
	Pre-requisites: STRS101									
	Governing differential equation for beam deflections. Deformations by virtual work. Statically indeterminate structures. Flexibility analysis methods such as consistent déformations and three-moments equation. Moving loads on beams.									
References	Structural Analysis II, Authors: A. Bazaraa and A. Akl, Structural Analysis, Author: R.C. Hibbler									
STRS203	Engineering Materials	3	2	1	0	2				5
	Pre-requisites: PHYS001, EMCS001									
	Classification of types of materials; Concrete and asphalt concrete; constituent materials and their properties, mix design, manufacture, properties, and standard and quality control testing; Steel, Building stones; Bricks; Timber; Heat insulating and acoustic materials. Laboratory: Testing for QC.									
References	"Properties of Concrete", A.M. Neville.,									
STRS204	Mechanics of Materials	3	2	2	0					4
	Pre-requisites: STRS203									
	Properties of plane areas. Stresses and strains for axial loading. Normal stresses due to normal force and bi-axial moments. Shear stresses due to shear force. Shear stresses due to torsion. Principal stresses and maximum shear stresses for 2D element. Buckling of columns.									
References	'Mechanics of Materials', Beer, Johnston & DeWolff, Structural Mechanics', Metwally Abdel Aziz									
STRS301	Reinforced Concrete Design -I	3	2	2	0					4
	Pre-requisites: STRS202, STRS204									
	Methods of design; Codes; Structural systems and load distribution; Design using limit states method; Section subjected to bending moments; Section subjected to shear and torsion; Reinforcement details for beams; Design and reinforcement details for solid slabs ; Design and reinforcement details of concrete short columns; Limit state of deflection, Working stress design method.									
References	Design of Reinforced Concrete Structures (Mashhour and El-Mihilmy) Volumes 1., الكود المصري لتصميم وتنفيذ المنشآت الخرسانية كود رقم 203- 2020, الكود المصري لحساب الأحمال والقوى في الأعمال الإنشائية وأعمال المباني - كود رقم 201 - 2012									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS302	Steel Structures Design -I	3	2	2	0					4
	Pre-requisites: STRS202, STRS204									
	Introduction to structural steel design – Design criteria (materials, loads, and systems) – General layout – Design of tension members – Design of compression members – Design of beams – Design of beam-columns.									
References	"Behavior, Analysis, and Design of Structural Steel Elements", Elsayed Bahaa Machaly - "Egyptian Code of Practice for Steel Construction and Bridges, ECP 205", latest edition									
STRS303	Reinforced Concrete Design -II	3	2	2	0					4
	Pre-requisites: STRS301									
	Design and reinforcement details: ribbed slabs, paneled beams slab, flat slabs (beamless slabs), stairs; Design of sections under eccentric forces; Design and reinforcement details of concrete long columns.									
References	Design of Reinforced Concrete Structures (Mashhour and El-Mihilmy) Volumes 2., الكود المصري لتصميم وتنفيذ المنشآت الخرسانية كود رقم 203- 2020, الكود المصري لحساب الأحمال والقوى في الأعمال الإنشائية وأعمال المباني - كود رقم 201 - 2012									
STRS205	Human Resources Managemen	2	1	2					1	3
	Pre-requisites: 34 cr. Hr									
	HR planning: Job analysis, demand for HR, Supply of HR – Staffing: Recruitment, Selection – Training and development – Performance Appraisal – Compensation: Type of equity, Designing the pay structure, employee benefits – Labour/management relations – Motivation – Leadership – Communication									
Textbook	Human Resource Management, eleventh edition, Gary Dessler ,2008.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Program Courses (Compulsory)										
IHDS308	Principals of Irrigation & Drainage	3	2	3	0					5
	Pre-requisites:									
	Definitions, Water resources, Components of irrigation systems, Irrigation water quality, Soil - water plant relationships, Estimation of water requirements, Introduction to various types of irrigation systems (Surface - Sprinkler - Drip), Subsurface drainage, Horizontal and vertical drainage. , Concepts of irrigation efficiency and uniformity.									
References	Irrigation & Drainage Engineering, Nasr Allam									
IHDS309	Water Chemistry & Microbiology	2	2	2						4
	Pre-requisites: CHES201									
	Basic water quality concepts, Basic chemistry concepts, Good laboratory practice, Standard solutions, Water color, odour and temperature, Understanding and measuring pH, Understanding and measuring EC, Understanding and measuring DO, Understanding and measuring COD, Understanding and measuring BOD, Basic aquatic chemistry concepts, Oxygen balance in surface waters, Major ions in water, Trace compounds in the aquatic environment, Potentiometric analysis of water quality, Use of ion selective probes, Absorption spectroscopy, Emission spectroscopy, Measurement of selected ions in water, Introduction to microbiology, Microbiological laboratory techniques, Coliforms as indicators of fecal pollution, How to measure coliforms									
References	Chemistry for Environmental Engineering and Science, Sawyer, McCarty, Parkin.									
IHDS306	Computational Water & Wastewater Networks	3	3			3				5
	Pre-requisites: IHDS201									
	Water distribution systems, demands, demand variables, pipe flow, networks, pumps, appurtenances, materials, Design techniques, Modeling of distribution systems, Design problem considerations-distribution, Wastewater collection systems, pipe flow, inflows, inflow variables, appurtenances, installation, materials, and Modeling of collection systems									
References	Water Supply and Sewage, Terrance J. MGGEE									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS301	Introduction to Water Resources Engineering	3	2	0	0	2				4
	Pre-requisites:									
	Hydrologic cycle, precipitation, infiltration, evaporation and evapo-transpiration, rainfall; Runoff relationships (rational method, unit hydrograph, statistical and probability approaches), stream flow hydrographs, types of aquifers, ground-water flow equations, well hydraulics, monitoring of groundwater levels, hydraulic characteristics of aquifers, groundwater management and safe yields.									
References	Water-Resources Engineering, 2/E David A. Chin Publisher: Pearson									
IHDS408	International Law of Water and Environment	1	2	0	0	0				
	Historical background, basis of the international law for water, legal aspects of the international agreements concerning shared water resources, international water laws and agreements, the legal system of the Nile basin (case study).									
References	International Water Law and the Quest for Common Security (Earthscan Studies in Water Resource Management) 1st Edition, Bjorn-Oliver									
IHDS419	Applied Hydrology	3	2	2	0	0				4
	Pre-requisites: IHDS301									
	The course covers two parts: surface and subsurface hydrology. The first part covers the Sources of Streamflow, Streamflow Hydrograph, SCS Method for Abstraction, Stream Network, Unit Hydrograph, Synthetic Unit Hydrograph, Unit Hydrograph for Different Rainfall Duration, Lumped Flow Routing, Hydrologic River Routing, Linear Reservoir Model, Distributed Flow Routing; Saint-Venant Equations, Wave Motion. The second part covers classification of hydro geological strata and its properties, general equation of groundwater flow, saturated/unsaturated flow, pollution mechanics and equations, introduction, equations of solute transport, governing equation, solute concentration,									
References	Applied Hydrology, Fetter									
IHDS307	Introduction to Climate Change	1	1	0	0	0				1
	Provides an introduction to global climate change processes, drivers, and impacts, Survey of the physical science of climate change, Why and how the world should solve this global problem and how they can contribute to the solutions, Climate adaptation in engineering. Greenhouse gases, global warming, paleoclimatology, and Earth system responses. Climate change impacts on structural, water, transportation, and energy systems. Climate vulnerability assessment, case studies of design adaptation.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS415	Management of Infrastructure Projects	2	2	2	0	0				4
	This is a management course in asset management of civil infrastructure assets with a particular focus on urban infrastructure systems. The course presents a generic framework for asset management that includes asset inventory, condition assessment, deterioration modeling, valuation, risk management, performance measures, levels of service, and budget allocation. Elements in this framework will be presented within the context of 4 civil infrastructures systems: Roads, Buildings, Water networks, and Sewer networks. The course will emphasize the use of emerging technologies, information systems, and decision-making tools that support the various elements of the asset management framework.									
References	Lecture Notes & Design Codes									
IHDS403	Field Measurements & Water Quality Aspects	3	2			2				4
	Pre-requisites: IHDS302									
	.The course covers two parts: surface and subsurface hydrology. The first part covers the Sources of Streamflow, Streamflow Hydrograph, SCS Method for Abstraction, Stream Network, Unit Hydrograph, Synthetic Unit Hydrograph, Unit Hydrograph for Different Rainfall Duration, Lumped Flow Routing, Hydrologic River Routing, Linear Reservoir Model, Distributed Flow Routing: Saint-Venant Equations, Wave Motion. The second part covers classification of hydro geological strata and its properties, general equation of groundwater flow, saturated/unsaturated flow, pollution mechanics and equations, introduction, equations of solute transport, governing equation, solute concentration									
References	Applied Hydrology, Fetter									
IHDS402	Environmental & Municipal Hydraulics	3	2	2	0	0				4
	Pre-requisites: IHDS309									
	Sources of pollution of surface and ground waters, Types and properties of pollutants, Evaluation of hazardous effects of pollutants, Spread and movement of pollutants in surface and ground waters, Motion and mass balance equations, Pollution measurement techniques. Environmental impact of hydraulic structures, Hydraulic methods of industrial and domestic sewage discharge into water bodies, Groundwater pollution and treatment, Water quality control for surface and ground waters.									
References	Introduction to Environmnetal Engineering, Mackenzie L. Davis									

Elective Group E-2

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
GENS341	Operation Research	3	2	2						4
	Pre-requisites: none									
	This course examines the evolving structure of cities andIntroduction - Linear programming, Network analysis, Decision analysis, Random processes, Queuing models, Inventory analysis, Simulation, Dynamic programming, Nonlinear programming, Game Theory, Waiting line theory.									
GENS342	Decision Support Systems	3	2	2						4
	Pre-requisites: none									
	Management Support Systems. Decision Making Process: Systems, Models, Sensitivity Analysis, "What-If?" Analysis, Goal Seeking, DSS Characteristics, DSS Components, DSS Hardware and Software, Static and Dynamic Models, Handling Certainty & Uncertainty, Mathematical, Programming, Simulation, Heuristic Programming, Forecasting, Financial and Planning Modeling. Artificial versus Natura Intelligence, Knowledge in AI. Fundamentals of Expert Systems.									

Program Courses (Electives)

Elective Group E-3

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS410	Participatory Irrigation Water Management	3	2	2	0	0				4
	Pre-requisites: IHDS308									
	The course covers the concept, types and features of PIM. PIM applications in Egypt will be covered at the different levels of the national irrigation system; the mesqa level, branch canal level and irrigation district level. The different types of farmers associations and their role in irrigation water management practices will be addressed. The problem of PIM applications and the gender issue will be discussed and analyzed. A one-day field trip to one of the PIM applications in Egypt will be organized									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS411	Water in the Arab Region and Africa	3	2	2	0	0				4
	Pre-requisites: IHDS301									
	Global Water Resources, Water Storage on the Earth and the Hydrological Cycle .River Basins, Continental Slopes, and the Inflow to the World Ocean, River Runoff and Ground Water, The Dynamics of Water Use in the World., Water Availability and Water Resources Deficit., The African Water Resources, Rainfall ,Runoff, Recharge, major Basins, Withdrawals, Accessibility, Irrigation Potential and Water Managed Areas, Irrigated Crops, State of the African Environment, Atmosphere, Biodiversity, Coastal and Marine Habitats, Forests, Freshwater, Land, Urbanization, Arab Water Resources: Precipitation - Potential Evaporation - Internal Renewable Water Resources - Total Renewable Resources - Non conventional Water Resources (Agricultural drainage reuse, wastewater reuse, desalination) - Groundwater resources- Land use - Sectoral Withdrawals - Food security / water security - IWRM status - Shared Water Resources - Water Quality.									
References	Lecture Notes & Design Codes									
IHDS412	Non Conventional Water Resources	3	2	2	0	0				4
	Pre-requistes: IHDS302									
	This course will focus on potential non-conventional waterresource applications such as; re-use and recycling of (urban waste water and agricultural drainage water) brackish groundwater and seawater desalination, cloud seeding, and rain water harvesting									
References	Lecture Notes & Design Codes									
IHDS413	Drainage Engineering	3	2	2	0	0				4
	Pre-requisites: IHDS308									
	Sources of drainage water, importance of land drainage, clarification of drainage systems (open and pipe drain). Design of horizontal and vertical drainage systems, drainage investigation and field measurments of relevant soil properties, drainage system performance, reuse of drainage water.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS417	Applied Hydrology Statistics	3	2	2	0	0				4
	Pre-requisites: MTHS005									
	This course involves the study of surface and subsurface variability and the interpretation of observations using existing theories. The course will cover: review of Introduction to Probability and Statistics, time-series modeling, estimation of static and dynamic hydrologic systems, analysis of spatial hydrologic processes. It incorporates updated techniques and applied statistics and geostatistics, risk analysis, the use of computers in statistical analysis, and the use of statistics in hydrologic and water quality modeling									
References	Lecture Notes & Design Codes									
IHDS418	Design of Pipelines and Pumping Stations	3	2	2	0	0				4
	Pre-requisites: IHDS201									
	Flow in pipes, friction losses, local losses, pump-pipeline systems, pump characteristic curves, system curves, operation point and pump performance, pumps in parallel and series, pump-pipe networks, water hammer.									
References	Lecture Notes & Design Codes									
IHDS451	Computational Hydraulics	3	2	2	0	0				4
	Pre-requisites: IHDS302									
	Introduction to numerical analysis via Matlab, Ordinary differential equations, Partial differential equations: Classifications of partial differential equations (elliptic, parabolic, hyperbolic), Types of boundary conditions- ; Examples of famous pde (Laplace equation, heat equation, wave equation). Introduction to the basics of finite difference techniques; applications: diffusion equation, advection equation, convection-diffusion equation, The de Saint Venant Equations - Numerical approaches: (truncation error and stability analysis); Method of finite elements. 2Dhydrodynamic and transport applications.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS459	Design of Water and Wastewater Treatment Plants	3	2	2	0	0				4
	Pre-requisites: PBWS303									
	This course familiarizes students with appropriate design criteria and the design process for water and wastewater treatment plants. This includes Introduction to wastewater treatment plant design - design flowrates, design mass loadings, process selection, and elements of conceptual process design, Physical unit operations - flow measurement, flow equalization, mixing, Design of physical treatment units - bar racks and screens, communitors, and grit chambers, Design of physical treatment units - primary sedimentation tanks and dissolved air flotation, Design of biological treatment units - activated sludge processes, Design of aeration systems, Design of sludge disposal/treatment facilities - Solids and sludge sources, characteristics, and quantities, regulations, thickening, and dewatering.								
References	Lecture Notes & Design Codes									
IHDS406	On Farm Irrigation Methods	3	2	2	0	0				4
	Pre-requisites: IHDS308									
	Irrigation systems principles and design procedures for design and operation of sprinkler, trickle, and surface irrigation systems									
References	Hoffman, G.J., R.G. Evans, M.E. Jensen, D.L. Martin, and R.L. Elliott. (2007). Design and Operation of Farm Irrigation Systems.									
References	Lecture Notes & Design Codes									
IHDS465	Integrated Waste Management	3	2	2	0	0				4
	Pre-requisites: 70- credit hour									
	This course provides students with basic knowledge and problem-solving practices addressing the general framework of waste management. It highlights the relative issues, identifies potential environmental impacts, and provides a selection of technical skills. The course will mainly cover municipal solid and liquid waste management. The full cycle will be considered including generation, collection, transfer and transport, material recovery (for solid wastes) and recycling and reuse. Specific topics will address two or more of the following: wind row composting, waste to energy, landfill design. construction and demolition waste management, health care management, and hazardous wastes management.									
References	Lecture Notes & Design Codes									

Elective Group E-4

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS415	Non-Conventional Wastewater Treatment Systems	3	2	2	0	0				4
	Pre-requiste: PBWS303									
	Introduction to Non-conventional wastewater treatment, Physicochemical Treatment Processes. Introduction to Biological Treatment Processes, natural-biological treatment, Natural law, Design of biological treatment systems for the treatment of municipal sewage									
References	Lecture Notes & Design Codes									
IHDS450	Hydrogeology	3	2	2	0	0				4
	Pre-requiste: IHDS301									
	Introduction: Hydrology and Hydrogeology, Hydrogeologists, Applied Hydrogeology, Soil Moisture and Groundwater: Porosity of Earth Materials, Specific Yield, Hydraulic Conductivity of Earth Materials, Effective Porosity, Forces Acting on Groundwater, Water Table, Infiltration, Soil Moisture, Theory of Unsaturated Flow, Water-Table Recharge, Aquifers, Aquifer Characteristics, Homogeneity and Isotropy., Principles of Groundwater Flow: Mechanical Energy, Hydraulic Head, Force Potential and Hydraulic Head, Darcy's Law, Permeameters, Equations of Groundwater Flow, Solution of Flow Equations, Gradient of Hydraulic Head, Flow Nets, Refraction of Streamlines, Steady Flow in a Confined Aquifer, Steady Flow in an Unconfined Aquifer, Fresh-Water-Saline-Water Relations, Tidal Effects., Groundwater Flow to Wells: Unsteady Radial Flow, Well Hydraulics in a Completely Confined Areally Extensive Aquifer, Flow in a Semi-Confined Aquifer, Effect of Partial Penetration of Wells, Water-Table Aquifer, Measurement of Aquifer Parameters Using Piezometers, Steady-State Radial Flow, Theis Equations, Intersecting Pumping Cones and Well Interference, Effect of Hydrogeologic Boundaries, Pumping-Test Design									
References	Applied Hydrology, Fetter									
IHDS452	Optimization Techniques	3	2	2	0	0				4
	Pre-requiste: MTHS102									
	The course will cover fundamental optimization methods, linear programming, integer programming, network models, and dynamic programming methods. Some discrete optimization techniques will also be ntroduced. The theory underlying the various optimization methods is covered. Applications from water resources engineering will be discussed.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS455	Irrigation Design Works: Control Structures	3	2	2	0	0				4
	Pre-requiste: IHDS308									
	Basis and procedures for designing control structures. Seepage under structures. Scour downstream of structures. Weirs: types and functions, stepped and flow measuring weirs, accuracy and submergence ratios, Structural design. Barrages: structural design, design and operation of gates.									
References	Lecture Notes & Design Codes									
PBWS441	Advanced Surveying & Digital Mapping	3	2	2	0	0				4
	Pre-requiste: PBWS202									
	Advanced surveying concepts and digital mapping systems are presented in relation to engineering. Geodetic techniques, computations and practices in establishing control points, dealing with coordinate system transformations, deformation monitoring and map projections are studied. Concepts of terrestrial and aerial photogrammetry for mapping are presented. Satellite surveying and mapping systems are overviewed, with emphasis on the Global Positioning System and Remote Sensing uses and applications in engineering.									
References	Lecture Notes & Design Codes									
PBWS445	GIS & Remote Sensing Applications	3	2	2	0	0				4
	Pre-requisites: PBWS202									
	This course provides a conceptual overview and hands-on experience using the GIS software, giving the background knowledge to quickly take advantage of GIS powerful display and query capabilities in such enhanced format supporting decision makers. It Introduce the concepts of GIS, Present GIS different uses, learn basic ArcView functionality, become familiar with the ArcView user interface, and Use ArcView to create charts and layouts. GIS graphic user interface (GUI): Interacting with the application window and its components; using online help, Projects and documents: How projects organize, manage and store documents (view, tables, charts and layouts), Creating and editing themes: Using GIS modules to create and edit shape themes, Tables: Creating tables from a variety of tabular data sources; selecting from a table; joining multiple tables; modifying table structure, Charts: Creating a chart for presenting and analyzing tabular data, Layouts: Combining views, tables, charts and images, as well as, logos and scale bars, to create layouts.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
PBWS446	Deep Excavation and Side Support	3	2	2	0	0				4
	Pre-requisites: PBWS302									
	Introduction to deep excavation – Slope stability – Construction of: sheet pile walls, -Selection of proper Retaining system – Insulation									
References	Lecture Notes & Design Codes									
STRS466	Design and Construction of Water and Wastewtaer Structures	3	2	2	0	0				4
	Pre-requisites: STRS301									
	Cracking limits, Design of watertight sections, Water pipe sections, Design of water structures; underground circular and rectangular tanks and swimming pools, elevated circular and rectangular deep and shallow tanks, Detailed design and construction of RC water and wastewater treatment facilities.									
References	Lecture Notes & Design Codes									
Elective Group E-5										
IHDS407	Irrigation Design Works: Crossing Structures	3	2	2	0	0				4
	Pre-requisites: IHDS308									
	Planning and design of irrigation and drainage networks, seepage losses, technical and economic feasibility of canal lining, irrigation structures and their functions, general requirements and design considerations (hydraulics, loads, stability, structural aspects), transitions and wing walls, design of typical conveyance and crossing structures (culverts, syphons, aqueducts, short span bridges), tail escapes, construction methods.									
References	Lecture Notes & Design Codes									
IHDS409	River Engineering	3	2	2	0	0				4
	Pre-requisites: IHDS302									
	Introduction, River morphology, Hydraulics of flow in river channels, Local scour around piers, Local scour around embankments, Flow in curved river channels, Analytical river morphology, River meanders, Physical modeling, Mathematical modeling for erodible channels, River training works, Field visits, Case studies.									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS401	Coastal and Harbour Engineering	3	2	2	0	0				4
	Pre-requisites: IHDS201									
	Introduction - Wave theory and characteristics - Wave forecasting - Wave transformation - Tides and water levels - Coastal sedimert - Harbour planning - Harbour and port facilities - Design of breakwaters - Design of berths - Inland navigation - Case studies.									
References	Introduction to Coastal Engineering and Management, Kamphuis									
IHDS404	EIA for Water, Wastewater & Irrigation Projects	3	2	2	0	0				4
	Pre-requistes: 90 Hours									
	Introduction to EIA, definitions, history, EIA procedures, base line environment, screening, scoping, impact assessment, mitigation measure, environmental management plan, EIA screen in Egypt, environmental impacts on; surface water, ground water, air, noise impact, health impact, culture impact. Impact assessment methods, check list, simple matrix, stepped matrix, loops and networks. Environmental management plan.									
References	Lecture Notes & Design Codes									
IHDS405	Integrated Water Resources Management	3	2	2	0	0				4
	Pre-requisites: IHDS301									
	System Dynamics, Causal Loop Diagrams, Water Resources Management, Decision Support Systems, Software Application using Vensim SD									
References	Vensim System Dynamics User Manual									
IHDS414	Water Resources Assessment	3	2	2	0	0				4
	Pre-requisites: IHDS301									
	The earth radiation balance, the hydrologic cycle, global water distribution, spatial variation, temporal variation, precipitation measurements, and forecast, Evapotranspiration, river runoff and forecast, soil holding capacity, recharge estimation, blue water, green water, gray water, global, regional, and national assessment methodologies									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS416	Advanced Fluid Mechanics	3	2	2	0	0				4
	Pre-requisites: IHDS201									
	Fluid Dynamics, The Concepts of systems and Control Volume, Euler's Equation of Motion along a Stream Line, The Bernoulli's Equation, Applications of the Energy Equation to Steady Fluid Flow Situations, Discharge Measurements, Quasi-Steady Flow applications, The Momentum Equation, The Linear Momentum), Equation, Applications Of the Linear Momentum Equation, Dynamic Thrust of a Jet, Forces on Pipe Fittings, The Hydraulic Jump, Losses in Sudden Pipe Contractions and Expansions, The Moment of Momentum Equation, Viscous Effects, Fluid Resistance, Laminar Flow between Parallel Plates, Laminar Flow in Pipes, The Reynolds Number, Turbulent Flow, Prandtl Mixing Length, Turbulent Flow in Pipes, Friction Losses in Pipes, Navier Stokes Equations, Velocities and Acceleration, The Stress Tensor, The Full Equation of Motion, The Boundary layer, Description of the Boundary Layer, Momentum Integral equations of the Boundary Layer, Laminar' Boundary Layer over a flat Plat, Turbulent Boundary Layer over a flat Plat, Forces on Immersed Bodies, Skin Resistance, form Resistance, Drag and Lift, Real Flow around a Cylinder.									
IHDS453	Advanced River Engineering	3	2	2	0	0				4
	Pre-requisites: IHDS409									
	Introduction, River morphology, Hydraulics of flow in river channels, Local scour around piers, Local scour around embankments, Flow in curved river channels, Analytical river morphology, River meanders, Physical modeling, Mathematical modeling for erodible channels, River training works, Field visits, Case studies									
References	Lecture Notes & Design Codes									
IHDS454	Wadi Hydrology	3	2	2	0	0				4
	Pre-requisites: IHDS419									
	Introduction, wadi definition, types of wadi, characteristics of wadi. Rainfall analysis; statistical and frequency analysis, desigr storm analysis, probable maximum precipitation. Runoff-rainfall relation, infiltration analysis, catchment losses, transmission losses, runoff computation methods for ungauged wacis, unit hydrograph, SCS method, curve number methods, empirical equation and formula. Runoff computation for gauged wadi, frequency analysis of flow, frequency analysis of runoff volume. Hydraulic design of wadi section, conventional computation methods, computer model. Wadi recharge, conventional computation methods, computer model. Wadi environmental aspects									
References	Lecture Notes & Design Codes									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
IHDS456	Design of Large irrigation structures	3	2	2	0	0				4
	Pre-requisites: IHDS302									
	Locks: Horizontal alignment, types, hydraulics of filling and emptying systems, design of walls and floor, Dams: types, purposes, annual and long term storage, design and operation of reservoirs, gravity concrete dams, analysis of seismic forces using psedo-static methods, earth-fill and rock-fill dams, precautions against seepage, stability of earth - fill and rock-fill dams, spillways.									
References	Lecture Notes & Design Codes									
IHDS458	Design of Coastal Protection Works	3	2	2	0	0				4
	Pre-requisites: IHDS401									
	Function and structural design of seawalls, breakwaters, groins and jetties for coastal and beach protection. Design of offshore structures - Floating structures - marine pipelines - Construction materials and methods - Environmental impact assessment - Case studies									