PART [C]: SPECIALIZED PROGRAMS

(2) Structural Engineering Program (STE)

برنامج هندسة الإنشاءات

جامعة القاهرة
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Credit Hours System

كلية الهندسة
Faculty of
Engineering

(2) Structural Engineering Program (STE)

برنامج هندسة الإنشاءات

رؤية البرنامج VISION

The vision of the program is to develop the Structural Engineering Program to be the best among similar programs offered by National Regional, and International Universities.

رسالة البرنامج MISSION

The mission of the Structural Engineering (STE) program based on the credit hours system at the Faculty of Engineering, Cairo University, is to provide a broad, well-rounded, and high-quality education in Civil Engineering with emphasis on the profession of Structural Engineering and its specific areas of materials, mechanics, analysis, and design. By completing the B.Sc. degree requirements of the STE program, the graduates will demonstrate professional competence to contribute in future efforts for developing and maintaining the infrastructure and environment at the national, regional and international dimensions.

GRADUATE ATTRIBUTES مواصفات الخريج

The STE 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 Engineering are broad statements that define the main characteristics and performance expected from all engineering students upon their graduation so that the graduate attributes of the STE program can be achieved as follows:

BASIC CIVIL Engineering graduate must be able to:

1. Develop solutions for complicated engineering problems by applying engineering fundamentals, basics of science and mathematics and by conducting experiments and analyzing data using statistical analysis and engineering judgement.
2. Use engineering processes to develop cost-effective solutions, considering global, cultural, social, environmental, ethical, factors within the principles of sustainable design and development. Also, applying cutting-edge technology and standards, quality norms, safety regulations, environmental concerns, and risk management principles.
3. Practice research strategies and investigation procedures in Engineering projects by conducting good planning and supervision.
4. Practice performing individually or in a team Using modern techniques of communication with a variety of audiences.
5. Utilize pioneering thinking and develop the leadership skills to adequately react to complex situations, apply modern knowledge of practice, lifelong learning strategies.
6. Select modern construction methods for structures using numerical techniques or measurements. Examine the construction method by applying civil engineering techniques such as: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, and Fluid Mechanics. Optimize the design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; Familiarize with Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors.
7. Design the construction processes and evaluate the construction defects, instability, and quality issues; and maintain safety measures in construction and materials. Understand biddings, contracts, project insurance and guarantees and assess environmental impacts of civil engineering projects.

In Addition to the above attributes for Civil Engineers; the Structural Engineering Graduate must be able to

8. Analyze and design special structures such as thin-walled structures. Provide structural detailing of prestressed concrete structures and design high rise buildings, bridges, tanks and tunnels under seismic loads.
9. Determine durability issues of different structures in various environments; design sustainable structures and provide inspection and maintenance plan of RC and steel structures while knowing the properties of advanced construction materials such as GFRP.

جامعة القاهرة
Cairo
University

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Bachelor of Science Degree
Credit Hours System

كلية الهندسة
Faculty of
Engineering

PROGRAM BENCHMARK مرجعية البرنامج

NARS 2018	LEVEL A	LEVEL B	LEVEL C	LEVEL D
	Totally Adopted P. A11	Partially Adopted	See below	----

In addition to the Engineering competencies (Level A), Civil Engineer competencies (Level B), the STE graduate should be able to:
LEVEL C:

- Analyze and design special structures such as domes, shells and thin-walled structures. Analyze, design and provide structural detailing of prestressed concrete structures.
- Determine, apply and design for seismic loads on different types of structures especially, high rise buildings, bridges, elevated tanks and tunnels.
- Determine Durability issues of different structures in different environments; design sustainable structures and provide inspection and maintenance plan of RC and steel structures.
- Know the properties of advanced construction materials, design and detail structural elements using advanced construction materials such as GFRP.

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

توصيف المقررات SPECIALIZED COURSES CONTENTS

Code	Name	Credit Hours	Category	Pre-requisite
STES280	Engineering Seminar	1	DR	30 CR.HRS. + AA APPROVAL
STES281	Industrial Training-1	1	FR	60 CR.HRS. + AA APPROVAL
STES381	Industrial Training-2	2	DR	STES281. + AA APROVAL
STES481	Graduation Project-1	1	FR	110 CR.HRS. + AA APROVAL
STES482	Graduation Project-2	3	DR	STES481
Total		**2+6**		

توصيف المقررات COURSES CONTENTS

Code	Name/Content	Credit Hours	Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Specialized Requirements										
STES280	Engineering Seminar	1	1	0						1
	Pre-requisites: 30 CR.HRS + 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.									
STES281	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.*									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours								
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STES381	Industrial Training-2	2	0	0						0
	Pre-requisites: STES281 + 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.									
STES481	Graduation Project-1	1	0	2	0					2
	Pre-requisites: 110 credits + SOPHOMORE Courses									
	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									
STES482	Graduation Project-2	3	1	4	0	0				5
	Pre-requisites: STES481									
	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									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo University

كلية الهندسة
Faculty of Engineering

PROGRAM REQUIREMENTS متطلبات البرنامج

Category		No. of courses	Course Credit Hour	Total Credit Hours
Discipline Requirements (DR)	core/ compulsory	19	3	57
		6	2	12
		2	1	2
Total DR courses		**27**		**71**
Program Requirement (PR)	core/ compulsory	2	2	4
		5	3	15
	Elective	0	2	0
		7	3	21
Total PR courses		**14**		**40**
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	INTS001 + INTS005
EMCS201	Engineering Mechanics-3- Rigid Body Dynamics	3	EMCS002
MTHS102	Linear Algebra and Multivariable Integrals	3	MTHS003
MTHS104	Differential Equations	3	MTHS003
MTHS300	Statistical Analysis for Civil Engineers	1	70 Credits
IHDS204	Civil Engineering Drawing	3	INTS001
IHDS201	Fluid Mechanics	3	PHYS001
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

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

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
STRS324	Construction Project Management	3	68 Cr Hrs
STRS302	Steel Structures Design I	3	STRS202 + STRS204
STRS303	Reinforced Concrete Design II	3	STRS301
STRS304	Steel Structure Design II	3	STRS302
STRS441	Reinforced Concrete Design III	3	STRS303
Total	Including STES280, 380, 382	**71**	

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

Code	Name	Credit Hours	Pre-requiste
STRS216	Properties and Strength of Concrete I	3	STRS203
STRS215	Engineering Computations	2	MTHS102 + STRS202
STRS305	Matrix Structural Analysis	3	STRS202
STRS306	Properties and Strength of Concrete II	3	STRS216
STRS308	Structural Systems and Optimization	2	STRS215
STRS408	Structural Dynamics and Vibrations	3	EMCS201 + STRS305
STRS409	Steel Multistory Buildings	3	STRS304
Total		**19**	

- ## Program Requirements (PR) elective courses list

Code	Name	Credit Hours	Pre-requiste
ELECTIVE (E-2) 2 courses (6 Credits)			
CVES461	Special Topics in Civil Engireering	3	90 CHs., AA
IHDS301	Introduction to Water Resources Engineering	3	75 Credits
IHDS462	Hydraulic Engineering	3	IHDS201

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name	Credit Hours	Pre-requiste
STRS322	Construction Planning and Scheduling	3	STRS324
STRS407	Masonry Structures	3	STRS303
STRS452	Information Technology in Construction	3	STRS324
ELECTIVE (E-3) 2 courses (6 Credits)			
PBWS446	Deep Excavation and Side Support	3	PBWS302
STRS410	Metallic Bridges	3	STRS304 + 120 credits
STRS437	Seismic Design of Structures	3	STRS303 +120 Hrs
STRS444	Special Concrete Structures	3	STRS303
STRS465	Inspection and Maintenance of Structures	3	STRS303
ELECTIVE (E-4) 2 courses (6 Credits)			
STRS433	Structural Mechanics and Stability	3	STRN305 + 120 credits
STRS443	Temporary Structures and Form Work Design	3	STRS303
STRS445	Steel Structures Design III	3	STRS304
STRS461	Special Topics in Structural Engineering	3	120 credits + AA Approval
STRS462	Advanced Topics in Structural Engineering	3	120 credits + AA Approval
ELECTIVE (E-5) 1 course (3 Credits)			
PBWS445	GIS and Remote Sensing Applications	3	PBWS202
STRS417	Computer-Aided Analysis and Design	3	STRS305 + 120 credits
STRS419	Quantity Surveying and Cost Engineering	3	STRS303 + 120 credits
STRS431	Concrete Durability	3	STRS306 + 120 credits
STRS432	Composite Materials	3	STRS306 + 120 credits
Total		**21**	

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

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 I	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						4
	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**			**28**

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo University

كلية الهندسة
Faculty of Engineering

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	Off Hr	Total
SEMESTER 3	MTHS102	Linear Algebra and Multivariable Integrals	3	2	2						4
	EMCS201	Engineering Mechanics-3- Rigid 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	2						4
	GENS110	Elective E-A (Fundamental of Management, Risk and Environment)	2	2							2
		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 4	MTHS104	Differential Equations	3	2	2						4
	IHDS201	Fluid Mechanics	3	2	2						4
	MTHS005	Introduction to Probability and Statistics	3	2	2						4
	INTS203	Mech. And Elec. Systems	2	1	2						3
	STRS204	Mechanics of Material	3	2	2						4
	STRS216	Prop. and Strength of Concrete - 1	3	2	2						4
	STRS215	Engineering Computations	2	1		1	2				4
		Sub-Total	**19**	**12**	**12**	**1**	**2**	**0**	**0**	**0**	**27**

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	Off Hr	Total
SEMESTER 5	GENS110	"Elective E-A (Fund. of Economics and Accounting)	2	2							2
	STRS324	Construction Project Management	3	2	2						4
	STRS301	Reinforced Concrete Design - 1	3	2	2						4
	E-1	Elective (E-1) GENS20X	2								2
	PBWS202	Surveying for Engineering	3	2		1	2				5
	STRS302	Steel Structure Design - 1	3	2	2						4
	PBWS303	Water and Wastewater Engineering	2	1	2						3
	MTHS300	Statistical Analysis for Civil Engineers	1	0	2						2
		Sub-Total	**19**	**13**	**10**	**1**	**2**	**0**	**0**	**0**	**26**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 6	PBWS302	Soil Mechanics	3	2	2						4
	STRS305	Matrix Struct. Analysis	3	2		1	2				5
	STRS303	Reinforced Concrete Design - 2	3	2	2						4
	STRS306	Prop. and Strength of Concrete - 2	3	2	2						4
	STRS308	Structural Systems & Optimization	2	1		2	1				4
	STRS304	Steel Structure Design - 2	3	2	2						4
	PBWS301	Highway Engineering	2	1	2						3
		Sub-Total	**19**	**12**	**10**	**3**	**3**	**0**	**0**	**0**	**28**

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo University

كلية الهندسة
Faculty of Engineering

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
	STRS408	Structural Dynamics and Vibrations	3	2		2	1				5
	STRS441	Reinforced Concrete Design - 3	3	2	2						4
	E-2	ELECTIVE E-2	3	2	2						4
	E-2	ELECTIVE E-2	3	2	2						4
	STRS409	Steel Multistory Buildings	3	2	2						4
	STES481	Graduation Project - 1	1		2						2
		Sub-Total	19	12	12	0	1	0	0	0	27

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 8	E-3	ELECTIVE E-3	3	2	2						4
	E-3	ELECTIVE E-3	3	2	2						4
	E-4	ELECTIVE E-4	3	2	2						4
	E-4	ELECTIVE E-4	3	2	2						4
	E-5	ELECTIVE E-5	3	2	2						4
	STES280	Engineering Seminar	1	1							1
	STES482	Graduation Project - 2	3	1	4						5
		Sub-Total	19	12	14	0	0	0	0	0	26

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: GENS003 + 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	• Ernst Neufert, Peter Neufert, Architects' Data, Fourth Edition, U.S.A, 2012. • Francis O.K. Ching, Building Construction Illustrated, Wiley, Fifth edition, 2014. • Francis D.K. Ching, Architecture: Form, Space and Order, John Wiley and Sons, New York, Fourth Edition, 2014.									
ARCS216	Introduction to CAD Systems for Civil Engineering	2	1	0	3					4
	Pre-requisites: INTS001 + INTS005									
	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									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo University

كلية الهندسة
Faculty of Engineering

Code	Name/Content	Credit Hours	Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
						Contact Hours				
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.									
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. 3. "Advanced Engineering Mathematics", John Wiley & Sons, Inc., 10th Edition, 2011, by Erwin Kreyszig.									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
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	2						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.									
IHDS201	Fluid Mechanics	3	2	2						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 transmition , 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, lamirar 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).									

جامعة القاهرة
Cairo
University

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

كلية الهندسة
Faculty of
Engineering

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	Nilsson, James William, and Susan A. Riedel. Electric circuits. Pearson, 2020.									
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 Tchobanogous, 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				5
	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 2017 "Elementary surveying; an introduction to geomatics" (15th edition) Pearson Prentice Hall New Jersey.,									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours							Total
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	
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	• "Traffic and Highway Engineering" by N. J. Garber and L. A. Hoel, Fifth Edition, 2014 • Islam, M. Rashad, and Rafiqul A. Tarefder. 2020. Pavement Design: Materials, Analysis, and Highways. 1st ed. New York: McGraw Hill.									
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., & Sivakugan, N. (2015). Introduction to geotechnical engineering. Cengage Learning.									
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	Structural Analysis, Author: R.C. Hibbler (10th edition) (2018), Pearson Education Inc.									

جامعة القاهرة
Cairo
University

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

كلية الهندسة
Faculty of
Engineering

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, Author: R.C. Hibbler (10th edition) (2018), Pearson Education Inc.									
STRS203	Engineering Materials	3	2	0	1	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	1) "Properties of concrete", Neville, A.M., Pearson Education Limited, Edinburgh Gate. Harlow, England, 2011 (Reference book). 2) "Engineering Materials a: An Introduction to Properties Applications and Design",Ashby, M.F. and Jones D.H.R., Butterworth-Heinemann, Massachutess, USA, 2012. 3) Egyptian Code of Practice ECP#203/2020.									
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 stress 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									

جامعة القاهرة
Cairo University

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

كلية الهندسة
Faculty of Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS324	Construction Project Management	3	2	2	0					4
	Pre-requisites: 68 CHs.									
	Project management definition, project delivery methods, contracting strategies, basic management functions, construction scheduling, bar charts, AOA and AON networks, critical path method, construction resources, material management, labor productivity, construction equipment, design and analysis of construction operations, construction cost, cost estimating, direct and indirect costs, cash flow calculations, introduction to management information systems.									
References	Halpin, D. W. (2010). Construction management. John Wiley & Sons. Project Management Institute. (2021). A guide to the Project Management Body of Knowledge (PMBOK guide) (7th ed.). Project Management Institute.									
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, 2020 "Egyptian Code of Practice for Steel Construction and Bridges, ECP 205", latest edition, 2018									
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									
STRS304	Steel Structures Design -II	3	2	2	0					4
	Pre-requisites: STRS302									
	Welded connections – Bolted connections (bearing and friction bolts) – Steel details for frames – Steel details for trusses – steel details for wind bracing									
References	"Behavior, Analysis, and Design of Structural SteelWork Connections", Elsayed Bahaa Machaly -Latest Edition, 2020 "Egyptian Code of Practice for Steel Construction and Bridges, ECP 205", latest edition,2018									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
						Contact Hours				
STRS441	Reinforced Concrete Design -III	3	2	2	0					4
	Pre-requisites: STRS303									
	Layout, Design and details of Large spar structures, Frames and Arches, Cracking limit state; Design of water structures; underground circular and rectangular tanks and swimming pools, elevated circular and rectangular deep and shallow tanks; Design of footings, raft foundations and pile caps.									
References	Design of Reinforced Concrete Structures (Mashhour and El-Mihilmy) Volumes 2, 3., 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	Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
						Contact Hours				
Program Courses (Compulsory)										
STRS216	Properties and Strength of Concrete I	3	2	2	0	0				4
	Pre-requisites: STRS203									
	Admixtures (mineral and non-mineral); Concrete manufacturing; Properties of fresh concrete; Properties of hardened concrete; Applied mix design; Non-destructive evaluation of concrete: strength evaluation using rebound hammer, ultrasonic, Windsor probe, concrete core; Code provisions for durable concrete; Creep.									
References	1) "Properties of concrete", Neville, A.M., Pearson Education Limited, Edinburgh Gate. Harlow, Essex CM20 2JE, England, 2011 (Reference book), 2) Egyptian Code of Practice ECP#203/2020									
STRS215	Engineering Computations	2	1	0	1	2				4
	Pre-requisites: MTHS102, STRS202									
	This course focuses on problem-solving techniques and skills by using spread-sheets and commercial software packages such as MATLAB. Topics include roots of equations, simultaneous linear equations, eigenvalue problems, numerical integration techniques, interpolation and curve fitting, data approximation, optimization, ordinary differential equations. Coding using modern programming languages.									
References	Steven Chapra's Applied Numerical Methods with MATLAB, third edition									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS305	Matrix Structural Analysis	3	2	0	1	2				5
	Pre-requisites: STRS202									
	Classical analysis methods for statically indeterminate structures such as moment distribution. Equilibrium, compatibility, and constitutive relations. Degrees of freedom and kinematic indeterminacy. Element stiffness matrix of bars, beams, frames, and grids. Coordinate transformations. Global stiffness equations; Matrix analysis of beams, frames, trusses, and grids. Self-strained problems; Computer applications									
References	Recommended Book: Ahmed, M.A., "Matrix Stiffness Analysis of Skeletal Structures". Second edition, 2011., Recommended Book: Megahed, H.A., "Stiffness Analysis of Structures". Second edition, 2011.									
STRS306	Properties and Strength of Concrete II	3	2	2	0	0				4
	Pre-requisites: STRS216									
	Introduction to composite materials: fiber reinforcement, types of fibers, physical, mechanical and chemical characteristics of different metallic and natural fibers, behavior of fiber reinforced composites; load tests; Hot and cold weather concreting; statistical quality control of concrete production; impact analysis; fatigue of metals and concrete.									
References	Neville, A. M., "Properties of Concrete"; John Wiley and Sons; 2013									
STRS308	Structural Systems and Optimization	2	1	0	2	1				4
	Pre-requisites: STRS215									
	Overall structural response and design: structural form, structural layout and idealization, global stability, beam and column systems, arches, cable systems, truss systems, braced frames, large span structures; Vertical and lateral load resisting systems; Mathematical optimization, engineering economic analysis, and decision analysis tools to evaluate and design engineering systems. Applications of linear and dynamic programming to engineering systems design problems. Applications.									
References	An Introduction to Structural Optimization, Peter Christensen and Anders Klarbring, Springer Science + Business Media 2009.									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS408	Structural Dynamics and Vibrations	3	2	0	2	1				5
	Pre-requisites: MECS201, STRS305									
	Dynamic equilibrium and governing equations. Analysis of free and forced vibration of single-degree-of-freedom systems. Damping modelling in structures. Response spectra. Generalized single-degree-of-freedom systems. Analysis of free and forced vibration of multi-degree-of-freedom systems. Response history analysis and numerical methods. Computer applications.									
References	• Ray W. Clough and Joseph Penzien ' DYNAMICS OF STRUCTURES ', McGraw Hill, 2nd Revised Edition, ISBN-13:978-0923907518, ISBN-10:0923907513 • MARIO PAZ 'STRUCTURAL DYNAMICS – THEORY & COMPUTATION ', VAN NOSTRAND REINHOLD, 5th Corrected Edition, ISBN-13:978-1402076671, ISBN-10:1402076673.									
STRS409	Steel Multistory Buildings	3	2	2	0	0				4
	Pre-requisites: STRS304									
	Introduction and background – Design philosophies, Building Systems, Loading, Structural Analysis, Floor Systems (composite construction, precast units, …), Vertical Elements (Columns, bracing, cores), Other details (stairs, parapets, …), Other design considerations (corrosion protection, human comfort, temperature, fire, …), The Envelop: Facades and roofing systems, Case studies of Multistory Buildings, Steel Construction and Sustainability.									
References	– Egyptian Code for Design of Steel Structures (ASD/LRFD), latest edition, 2018 – Multi-Storey Steel Buildings. European project "Facilitating the market development for sections in industrial halls and low rise buildings (SECHALO) RFS2-CT-2008-0030". – DESIGN OF STEEL STRUCTURES, William T. Segui, Thomson, latest Edition. – Steel Structures: Design and Behavior, Charles G. Salmon, John E. Johnson, Faris A. Malhas, latest Edition, Pearson									

جامعة القاهرة
Cairo
University

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

كلية الهندسة
Faculty of
Engineering

Program Courses (Electives)

Elective E-2

Code	Name/Content	Credit Hours	Contact Hours								
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
CVES461	Special Topics in Civil Engineering	3	2	2	0	0				4
	Pre-requisites: 90 CHs., AA									
	One or more topics in the discipline of Civil Engineering that are not covered by other program courses and/or present recent or advanced development of interest to civil engineers.									
References	CSA S806:12 (R2021) Design and construction of building structures with fibre-reinforced polymers									
IHDS301	Introduction to Water Resources Engineering	3	2	2	0	0				4
	Pre-requisites: 75 CHs.									
	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, 3rd/E David A. Chin Publisher: Pearson, 2012									
IHDS462	Hydraulic Engineering	3	2	2	0	0				4
	Pre-requisites: IHDS201									
	Open channel flow: types of flow, conservation laws of mass and energy, specific energy concept, flow resistance in channels, sketching and calculations of water surface profile for gradually varied flow, design of cross sections in open channels, momentum equation and specific force concept, design of stilling basins downstream of gates and pipe outlets; Introduction to river engineering and sediment transport; Pumps: types and characteristics of pumps, pumps and pipeline systems; Hydraulics of groundwater: types of aquifers, groundwater flow, design of wells.									
References	Chaudhry, M. H. (2022). Open-channel flow. 3rd edition, New York: Springer									
STRS322	Construction Planning and Scheduling	3	2	2	0	0				4
	Pre-requisites: STRS324									
	Construction planning, importance of scheduling, scheduling techniques, program evaluation and review technique (PERT), line of balance, schedule updating, project crashing, time cost trade-off, resource scheduling, resource allocation and leveling techniques, project planning and control using commercial software.									
References	"Project Scheduling and Management for Construction" by David R. Pierce, 4th ed., John Wiley & Sons, Inc., Hoboken, New Jersey, 2013,									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo University

كلية الهندسة
Faculty of Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS407	Masonry Structures	3	2	2	0	0				4
	Pre-requisites: STRS303									
	Masonry Materials, Development of Building Structures, Elements, Systems. Types of Masonry Construction (Un-reinforced, Reinforced, Prestressed), Structural Design, Structural Requirements, Mortar – Grout – Reinforcement – Masonry Assemblages – Strength; Flexural, Axial compression, Combined axial comp. and Flexure, and Shear. Beams and Lintels. Axial and out of Plane loads, Columns and Pilasters, Shear Walls, Construction Considerations and Details.									
References	ECP 204-2005, Egyptian code for the design of masonry structures (2005), Building construction, course notes by Prof. Dr. Hossam Hodhod									
STRS452	Information Technology in Construction	3	2	2	0	0				4
	Pre-requisites: STRS324									
	Software systems in construction management: scheduling, cost estimating, material management, documents management and, 4D CAD systems. Introduction to Building Information Modeling. Use and design of databases and programmable spreadsheets for construction applications.									
References	* Introduction to Construction Contract Management, By Brian Greenhalgh,2017 · * "Applications of Information Technology in Construction", by Institution of Civil Engineers (Author), J. W. S. Maxwell (Editor), Thomas Telford Publishing; First Edition edition (January 1, 1994)									

Elective E-3

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off Hrs	Total
PBWS446	Deep Excavation and Side Supports	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	Das, B. M., & Sobhan, K. (2014). Principles of geotechnical engineering, SI edition. Boston: Cengage Learning.									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo University

كلية الهندسة
Faculty of Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS410	Steel Multistory Buildings	3	2	2	0	0				4
	Pre-requisites: STRS304									
	Structural system for bridges; Floor types; Design loads; Design of plate Girders, buckling considerations, fatigue effect, cross-section design, construction details; Design of composite beams; Design of box girders; Design of truss bridges.									
References	Steel Bridges: Prof. Metwally Abou-Hamd, latest edition									
STRS437	Seismic Design of Structures	3	2	2	0	0				4
	Pre-requisites: STRS303 + 120 Hrs									
	Conceptual design of structures to resist earthquakes. Structural layout and irregularities. Ductility concepts and capacity design. Lateral force resisting systems. Methods of analysis and design: equivalent static forces and code design criteria, response spectra analysis, time-history analysis. Computer applications.									
References	Dynamics of Structures, by Anl Chopra									
STRS444	Special Concrete Structures	3	2	2	0	0				4
	Pre-requisites: STRS303									
	Lateral loads; earthquake and wind. Lateral load resisting systems, analysis, design, and detailing. Prestressed concrete design. Reinforced concrete bridges; loads, types and systems, analysis, design, detailing, special considerations.									
References	Egyptian Code for Design and Execution of Concrete Structures 203-2020									
STRS465	Inspection and Maintenance of Structures	3	2	2	0	0				4
	Pre-requisites: STRS303									
	Introduction – Causes of Deterioration and needs for Repair - Methodology and strategy of repair - Symptoms, Diagnosis, Treatment - Assessment of strength of concrete structures - Repair: materials, methods, strengthening - Brick walls: inspection and repair.									
References	الكود المصري لتصميم وتنفيذ المنشآت الخرسانية كود رقم 203-2020 ACI 562M-16- Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary – 2016									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Elective E-4

Code	Name/Content	Credit Hours	Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
			Contact Hours							
STRS433	Structural Mechanics and Stability	3	2	2	0	0				4
	Pre-requisites: STRS305, 120 CHs.									
	3D stress-strain relations. Work and energy. Boundary-value problems. Stresses in cable structures. Bending of thin-walled structures and curved beams. Analysis of circular and rectangular plates. Theories of failure and structural stability. Computer applications.									
STRS443	Temporary Structures and Form Work Design	3	2	2	0	0				4
	Pre-requisites: STRS303									
	Introduction to construction applications of concrete; Economy and safety of formwork; Material properties and allowable stresses; Design loads of formwork (vertical loads , lateral pressure); Method of analysis; Forms for footings; Forms for walls and columns; Forms for beams and floor slabs; Failures of formwork; Shores and scaffolding.									
References	"Formwork for Concrete Structures", R.L. Peurifoy, P.E., McGRAW-HILL BOOK COMPANY, Second Edition									
STRS445	Steel Structures Design III	3	2	2	0	0				4
	Pre-requisites: STRS304									
	Special steel structures: Telecommunication Towers, Transmission Towers, Welded liquid storage tanks, Silos and bunkers; statical system, stability, loading, design codes, design, and detailing.									
References	· Egyptian Code of Practice for Steel Construction and Bridges. , latest edition,2018 · Design Standard for High Voltage Overhead Transmission Lines 33kV–500kV. Ministry of Energy and Electricity. · American Water Works Association – AWWA- D100									
STRS461	Special Topics in Structural Engineering	3	2	2	0	0				4
	Pre-requisites: 120 CHs., AA									
	One or more topics in the specialization of Structural Engineering that are not covered by the other program courses and/or present recent or advanced development of interest to the structural engineers in the areas of building materials, solid mechanics, analysis and design of structures.									
References	CPCI Design Manual 5th Edition									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS462	Advanced Topics in Structural Engineering	3	2	2	0	0				4
	Pre-requisites: 120 CHs., AA									
	One or more topics in the specialization of Structural Engineering that are not covered by the other program courses and/or present recent or advanced development of interest to the structural engineers in the areas of building materials, solid mechanics, analysis and design of structures.									
References	Design of Reinforced Concrete Halls,Tanks, Fundamentals By Prof. Dr. M. Hilal, Theory and Design of Concrete Shells by B. K. Chatterjee, Design and Construction of Concrete Shell Roofs By G. S. Ramaswamy,									

Elective E-5

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
PBWS445	GIS and 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	1. DeMers, Michael N. ,2016 "Fundamentals of geographic information systems "(4th edition) John Wiley & Sons, USA. 2. CRCSI (2017) Earth Observation: Data, Processing and Applications. (Eds: Harrison, B.A., Jupp, D.L.B., Lewis, M.M., Forster, B.C., Mueller, N , Phinn, S., Coppa, I., Hudson, D., Smith, C., Grant, I., Anstee, J., Dekker, A.G., Ong, C., and Lau, I. CRCSI, Melbourne. 3. Khorram, Siamak, van der Wiele, Cynthia F, Koch, Frank H, Nelson, Stacy A. C & Potts, Matthew D 2016, Principles of Applied Remote Sensing, Springer International Publishing AG, Cham.									

BYLAWS 2023
Bachelor of Science Degree
Credit Hours System

جامعة القاهرة
Cairo
University

كلية الهندسة
Faculty of
Engineering

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
STRS417	Computer-Aided Analysis and Design	3	2	2	0	0				4
	Pre-requisites: 120 CHs., STRS305									
	Selection of suitable models for different structures. Analysis and design of structures using commercial software programs such as SAP2000, STAAD CSI column. Influence line analysis of structures using software packages. Applications of spreadsheets and Matlab in analysis and design.									
References	M. Papadrakakis, E. Sapountzakis, Matrix Methods for Advanced Structural Analysis, 1st edition, Butterworth-Heinemann, 2017 S. Chandrasekaran, Advanced Structural Analysis with MATLAB, 1st edition, CRC Press, 2018									
STRS419	Quantity Surveying and Cost Engineering	3	2	2	0	0				4
	Pre-requisites: 120 CHs., STRS303									
	Importance of quantity surveying and pricing for engineering projects; Estimating principles: approximate and detailed estimates, quantity survey, labor & equipment cost, subcontractor cost, purchasing orders, indirect costs; Bidding process, strategy, documents and calculations; Unit cost estimate; Cost planning; Traditional cost control methods; Network base cost control methods; Contract forms and administration.									
References	PMBOK / Peurifoy and Eberlender; "Estimating Construction Costs"; McGraw-Hill; 2013									
STRS431	Concrete Durability	3	2	2	0	0				4
	Pre-requisites: 120 CHs., STRS306									
	Pore Structure; Permeability measurements, porosity and sorptivity: Transport mechanisms; Chloride ion ingress, acid, fresh water, and soft water attack; Design for durability and service life estimation.									
References	Newman and Choo; "Advanced Concrete Technology", Latest Edition Egyptian Code of RC Structures ECP-203-2020									
STRS432	Composite Materials	3	2	2	0	0				4
	Pre-requisites: 120 CHs., STRS306									
	Definition of a composite material; Natural metallic and synthetic fibers; Composite materials under tension; Composite materials under shear; Fiber reinforced polymers; Non-metallic concrete reinforcement.									
References	Egyptian code for the design and construction of fiber reinforced polymers in the field of construction, Ministry of housing, utilities, and urban development: Code ECP 208-2005 Fiber Reinforced Cement and Concrete Composites, Antoine Naaman, Techno Press, Florida USA 2017									