زانکۆی پۆلیتەکنیکی هەولێر

کۆلێژی تەکنیکی ئەندازیاری هەولێر / بەشی تەکنیکی ئەندازیاری شارستانی

وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی بالا- ماستەر

(Construction materials &Structure) پسپۆری

No.	Subject	Topics	References
1	Engineering Mechanics	- Force Vectors - Force System Resultant - Equilibrium of Rigid Bodies - Analysis of Simple Trusses - Friction - Center of Gravity and Centroid Moments of Inertia	Engineering Mechanics (R.C. Hibbeler)
2	Strength of Materials	- Stress and Strain - Mechanical properties of materials - Axial Load - Torsion - Bending - Transverse Shear - Combined Loading Stress and Strain Transformation	Mechanics of Materials (R.C. Hibbeler)
3	Structural Analysis	- Stability - Influence lines for Indeterminate beams - Deflection of beams and frames (Unit load method) - Analysis of Indeterminate beams and frames (Slope deflection method) Analysis of Indeterminate beams and frames (Moment Distribution Method)	Structural Analysis (R.C. Hibbeler)
4	Reinforced Concrete Design	- Components of Reinforced Concrete. - Strain and Stress diagram for Concrete and Steel Reinforcement. - Elastic behavior of reinforced concrete member subjected to axial loads (compression and tension). - Flexural Analysis and Design of Beams. - Design and Analysis of Rectangular Reinforced Concrete Beams (One Way Slab). - Shear Design & Theories. - Development Length of the Reinforcement. Design of Reinforced Concrete Columns (Short & Long).	Design of Concrete Structures (Nilson, Darwin and Dolan)
5	Concrete Technology	- Cement and Manufacture of cement. Hydration and cement structure, properties of cement paste, gel/space ratio. Types of cement, Aggregate, Classification and types of Aggregate. Physical properties of Aggregate and Mechanical properties. - Chemical Admixtures, types and uses. Mineral Admixtures (fly ash, Silica fume, slag) - Properties and Tests of fresh concrete. Workability, Segregation, bleeding, Plastic shrinkage. - Manufacturing and transportation of concrete. - Concrete pumping. - Placing, compacting and curing. Methods of concrete compaction. - Properties of hardened concrete. (Strength and Tests); Compressive, tensile and flexural, Modulus of elasticity. -Non-destructive tests of concrete, ultrasonic and Schmidt hammer. Examination - Types of shrinkage, Drying shrinkage, Mechanism of shrinkage	Properties of Concrete (by A.M. Neville)

		Factors influencing shrinkage - Special types of concrete (lightweight concrete and high strength concrete)	

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وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی بالا- **دکتۆرا**

پسپۆری **(Structure)**

No.	Subject	Topics	References
1	Theory of Plates and Shells	- General Introduction - Pure Bending of Plate - Small Deflection Laterally Loaded Plate - Simply Supported Rectangular Plates	Theory of Plate and shells (by Timoshenko)
2	Advanced reinforced concrete design	- Introduction - Materials (Concrete and Steels) - Flexure and Shear Design of Beams - Elastic Design of Concrete Sections - Plastic Design of Concrete Sections - Serviceability - Design of Slabs and Columns - Yield Line Analysis of Slabs - Strut and Tie Method	Design of Concrete Structures (by Nilson, Darwin and Dolan)
3	Prestress of Concrete	- Introduction - Effect of Prestressing - Prestressing Losses - Elastic Flexural Analysis - Concrete and Steel for Prestressed Construction	Prestressed Concrete (by E.G. Nawy)
4	Finite Element	- (Including derivation of stiffness matrices, Stiffness assemblage, solution….) - Spring Elements - Bar elements - Beam elements - Linear-Strain Triangle Elements - Plane stress and plane strain - Practical Consideration for Modelling - Isoperimetric Elements - Newton-Cote Numerical Integration	A First Course in the Finite Element Method (by Dayrl L. Logan)
5	Theory of Elasticity	- Introduction (general Concepts) - Components of Stress and Starin - Hooks law - Plane Stress and Plane Strain - Two-Dimensional Problems in Rectangular Coordinates	Theory of Plate and shells (by Timoshenko)

No.	Subjects	Topics	References
1	Fluids Mechanics	• Fluid Properties (Fundamental of Fluid Mechanics) • Fluid Statics • Fluid Dynamics • Continuity Equation • Bernoulli Equation • The Energy Equation • Series Parallel Piping System • Momentum Equation	**Eng. Fluid Mechanics By: John A. Roberson and et al.**
2	Thermodynamics	• Energy Conversion and General Energy Analysis • Energy Analysis of Closed Systems • Mass and Energy Analysis of Control Volumes and • the Second Law of Thermodynamics • Entropy and Exergy: A Measure of Work Potential • Gas Power Cycles, Vapor and Combined Power Cycles • Gas–Vapor Mixtures, Air-Conditioning and Refrigeration Cycles	**Thermodynamics: An Eng. Appr. By: Y. A. Cengel**
3	Heat Transfer	• Conduction Heat Transfer • Multi-dimensional Conduction Heat Transfer • Forced Convection Heat Transfer • Natural Convection Heat Transfer • Radiation Heat Transfer • Heat Exchangers	**Heat and Mass Transfer By: Y. A. Cengel**
4	Renewable Energies	• Introduction to Renewable energies • Energy demand • Solar Characteristics • Performance of solar collectors • Energy Storage • Solar Economics Analysis	**Solar Energy Eng. Proc. and Sys. By: S. A. Kalogirou**
5	Power Plants	• Power Plant Cycles • Chimney Draught	**Power Plant Technology By: A. K.**

No.	Subjects	Topics	References
		• Boilers • Feed Water Heaters and Evaporators • Performance of Boilers • Steam Turbines and Condensers • Cooling Ponds and Cooling Towers • Advantages and Disadvantages of Steam Power Plants • Gas Turbine Power Plants • Fuel and Combustion	**Raja and et al.**

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کۆلێژی تەکنیکی ئەندازیاری هەولێر / بەشی ئەندازیاری میکانیك و ووزه
وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی باڵا- ماستەر
پسپۆری :Applied Mechanics

No.	Subjects	Topics	References
1	Eng. Materials	• Failure • Phase Transformation • Composite Materials • Corrosion and degradation of Materials • Imperfections in Solids • Mechanical Properties of Metals	**Materials Science and Engineering By: D. G. Rethwisch and W. Callister**
2	Machine Design	• Failures Resulting from Static Loading • Fatigue Failure Resulting from Variable Loading • Shafts and Shaft Components • Mechanical Springs • Rolling-Contact Bearings • Lubrication and Journal Bearings • Gears	**Shigley's Mech. Engineering Design By: R. Budynas and K. Nisbett**
3	Theory of Vibration	• Fundamentals of Vibration • Free Vibration of Single-Degree-of-Freedom • Harmonically Excited Vibration • Two-Degree-of-Freedom Systems • Multidegree-of-Freedom Systems • Determination of natural Frequencies and Mode Shapes	**Mechanical Vibrations By: S. Rao**
4	Quality Control	• The Meaning of Quality and Quality Improvement • Management Aspects of Quality Improvement • Quality Costs	**Introduction to Statistical Quality Control By: D. C. Montgomery**

		- The Rest of the Magnificent Seven - Control Charts for X and R - Charts Based on Standard Values - Control Charts for Nonconformities (Defects) - Appendix VI	
5	Welding Tech.	- Power source for arc welding - Shielded Metal arc welding - Gas tungsten arc welding TIG - Gas metal arc welding MIG/MAG - Resistance welding - Gas welding	**Modern Welding Technology By: H. B. Cary**

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وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی بالا- **ماستەر**

پسپۆری   Renewable Energy-Solar Cells:

No	Subjects	Topics	References
1	**Electromagnetics**	• Time-Varying fields and Maxwell's Equations • Transmission Lines • The Uniform Plane Wave • Plane Wave Reflection and Dispersions	• **Engineering Electromagnetics** by William Hayt and John Buck
2	**Electronics**	• Semiconductors • p-n Junction • Diode Application • Bipolar Junction Transistor • Field Effect Transistor (FET)	• Thomas L. Floyd, **Electronic devices**, 9th edition, 2012. • **Principles of Electronics**, V. K. Mehta & Rohit Mehta, Publisher: S. Chand & Co Ltd, Year: 2008, Edition: 11th. • **Basic Electronics: Theory and Practice**, S. Westcott & J. Riescher Westcott, Publisher: David Pallai, Mercury Learning and Information, Year: 2015.
3	**Optics**	• **Geometrical Optics** Reflection and Refraction Velocity of Light • **Interference** • **Diffraction** • **Polarization** • **Thin Film** • **Spectroscopy**	1- **A Text book of Optics**, N.S. Brijlal, S.Chand & Co. Ltd., New Delhi, 2009. 2- **Physical optics**, A. K. Ghatak Tata McGraw Hill Publishing House Co. Ltd., New Delhi, 2006. 3- **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, McGraw Hill Inc.
4	**Solid State Physics**	• Chapter 1 Crystal Structure • Chapter 2 Reciprocal lattice • Chapter 8	**Introduction to solid state physics** By: Charles Kittle

		Semiconductor crystals	
5	**Renewable Energy**	1. Solar Energy: Solar Radiation, Measurements of Solar Radiation, Flat Plate And Concentrating Collectors, Solar Direct Thermal Applications, Solar Thermal Power Generation, Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power Generation, Solar PV Applications. 2. Wind Energy: Wind Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Details of Wind Turbine Generator. 3. Hydraulic and Wave Energy: Ocean Thermal Energy Conversion (OTEC), Principle of operation, development of OTEC plants, Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants. 4. Geothermal Energy Resources, types of wells, methods of harnessing the energy. 5. Bioenergy System: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking	John Twidell and Tony Weir, Renewable Energy Resources, Taylor & Francis, Second edition published 2006.
6	**Power & Machine**	1-Induction motors & Synchronous machine. 2- Power plants. 3-Transmission&Distribution. 4- Power system analysis. 5- Protections	- A Course in Electrical Power: J.B Gupta - A Textbook of Power Plant Engineering Paperback: R.K. Rajput

No.	Subjects	Topics	References
1	Advanced Fluids Mechanics	• Fluid Kinematics • Control Volume • Boundary Layer • Two-Phase Flow	**Fluid Mechanics By: V. L. Streeter et. al.**
2	Advanced Thermodynamics	• First and second laws of Thermodynamics and Energy Analysis for a Control Volume • Entropy and Exergy • Power and Refrigeration Systems with Phase Change and Gaseous Working Fluids • Gas Mixtures • Thermodynamic Relations • Chemical Reactions and Introduction to Phase and Chemical Equilibrium	**Fundamentals of Thermodynamics By: C. Borgnakke and R. Sonntag**
3	Advanced Heat Transfer	• Transient Conduction Heat Transfer • Multi-dimensional Transient Conduction Heat Transfer • Boiling Heat Transfer • Condensation Heat Transfer	**Heat and Mass Transfer By: Y. A. Cengel**
4	Renewable Energies	• Fundamentals of solar radiation • Flat plate collectors • Energy storage • Solar process economics • Solar water heating: active and passive • Solar Cooling	**Solar Eng. of Thermal Pro. By: J. A. Duffie**
5	Advanced Eng. Mathematics	• Partial Differential Equation (Heat Equation) • Fourier Analysis (Fourier Cosine + Sine Series) • Solution of Differential Equation by Laplace Transformation • Series Solution of Differential Equation using Recurrence Relations Method of Frobenius • Vectors and Liner Algebra (Matrices + Determinants + Inverse of Matrix)	**Advanced Engineering Mathematics By: Peter O'Neil**

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وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی بالا- دکتۆرا

پسپۆری Applied Mechanics:

No.	Subjects	Topics	References
1	Tribology of Machine Elements	- Engineering Surfaces - Contact Between Surfaces - The Friction of Solids - Wear and Surface Damage - Boundary Lubrication and Friction - Rolling Contacts and Rolling-Elements Bearings	**Engineering Tribology By: John Williams**
2	Advanced Material Science	- Phase Diagrams - Phase Transformations: Development of Microstructure and Alteration of Mechanical Properties - Applications and Processing of Metal Alloys - Structures and Properties of Ceramics - Applications and Processing of Ceramics - Polymer Structures - Characteristics, Applications, and Processing of Polymers - Composite	**Materials Science and Engineering By: D. G. Rethwisch and W. Callister**
3	Advanced Manufacturing Processes	- Material Removal Processes - Mechanical Processes - Chemical Processes - Electrochemical Processes - Thermal Processes - Hybrid Electrochemical Processes	**Advanced Machining Process By: Hassan abdel Gawad El Hofy**
4	Computational Stress Analysis	- Computational Homogenization for Non-Linear Heterogeneous Solids - Two-Scale Asymptotic Homogenization-Based Finite Element. Analysis of Composite Materials - Multi-Scale Boundary Element Modelling of Material Degradation and Fracture - Non-Uniform Transformation Field Analysis: A Reduced Model for Multiscale Non-Linear Problems in Solid Mechanics - Multiscale Approach for the	**Multiscale Modeling in Solid Mechanics Comp. Appro. By: U. Galvanetto and et al.**

		Thermomechanical Analysis of Hierarchical Structures • Recent Advances in Masonry Modelling: Micromodelling and Homogenization	
5	Advanced Eng. Mathematics	• Partial Differential Equation (Wave Equation) • Fourier Analysis (Fourier Cosine + Sine Series) • Series Solution of Differential Equation using Recurrence Relations Method of Frobenius • Vectors and Liner Algebra (Matrices + Determinants + Inverse of Matrix)	**Advanced Engineering Mathematics By: Peter O'Neil**

زانکۆی پۆلیتەکنیکی هەولێر

کۆلێژی تەکنیکی ئەندازیاری هەولێر / بەشی تەکنیکی ئەندازیاری سیستەمی زانیاری
وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی بالّا- ماستەر

No.	Subjects	Topics
1	Computer Networks	1- Computer network and the Internet (Chapter 1 Ref 1) 2- Fundamentals of Ethernet LANs, WANs and IP Routing (chapter 2,3 ref 2) 3- Principles of VLANs (chapter 8, ref 2) 4- The Network Layer (chapter 4, ref 1) 5- IPv4 addressing (Part IV, ref 2)
2	Object Oriented Programming	1. Data Types ✓ Assignment; Initialization; Constants; Operator's Precedence Conditional Statements and Loops: ✓ if Single-Selection Statement ✓ if...else Double-Selection Statement ✓ while Repetition Statement ✓ To use the for and do...while repetition 2. Methods Program Modules ; ✓ programmer-defined methods. ✓ Method Overloading/Overriding 3. Arrays: ✓ Declaring and Allocating Arrays ✓ initializing an array ;1- with new ✓ initializing an array ;2- without new ✓ totals the values of all the elements in array a.(Sum,Max,Min,sort, find elements…) 4. Class: ✓ Modifiers: Private, Default, Protected, Public: ✓ Class and method ✓ constructor for a class ✓ Inheritance ✓ Polymorphism ✓ Abstract Classes
3	Database Management Systems	1-Introduction to Database Management System (Database and Database management system-Data base System Applications, Purpose of Database Systems, Advantages and Disadvantages of DBMS-View of Data – Data Abstraction – Instances and Schemas –data Models -Database Languages - DDL – DML – database Access for applications Programs – data base Users and Administrator – data base Architecture - the Query Processor - Storage Manager –Transaction Manager. 2- Conceptual Database Design - Entity Relationship (ER)

			Modeling (Database Design Techniques - ER Model -Entities, Attributes and Entity sets - Relationships and Relationship sets - Advantages and Disadvantages of ER Modeling - Relational Model- Database Schema- Keys–- Schema Diagrams.
			3-Relational Algebra and Calculus (Relational Query Languages, Relational Operations. Relational Algebra – Selection and projection set operations – renaming – Joins – Division –Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus. Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries, Views, Triggers. Introduction to the Relational Model – Structure – Database Schema, Keys – Schema Diagrams)
			4-Normalization (Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyee /Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form)
4	Computer Architecture		1- Computer Systems Basics
			It covers the basics of computer architecture (Von Neumann Architecture), computer systems, basic concepts, historical background on computer architecture development, and key parameters of the performance of computer architecture and
			2- Central Processing Unit and Microprocessors
			It covers CPU description and processes, Architecture of CPU and mechanism of its work, Instruction set and their mechanism of work, microprocessors, and 8086 microprocessor structure and instruction set.
			3- Memory System
			It covers all memory types including internal, external, and cache memories, memory type descriptions and functionalities, and memory organization.
			4- Input/Output Modules and System Bus
			It covers input/out unit descriptions and functionalities, the architecture of the units, the mechanism of their work with other units, external interconnection standards (e.g., USB, Type C, … etc.), and the system bus that connects all computer modules.
			5- Multiprocessor

No.	Subjects	Topics	References
		It covers Flynn's classification, Amdahl's Law Defined, Optimizing Algorithms	
		6- Parallel Organizations	
		It covers parallel processing and related mechanism, multicore computer	
5	Mathematics	1. Differentiation	
		2. Integrations	
		3. Partial Derivatives and Double Integrals	
		4. Series	
		5. Linear Systems (Matrices and Vectors)	

زانکۆی پۆلیتەکنیکی هەولێر

کۆلێژی تەکنیکی ئەندازیاری هەولێر / بەشی تەکنیکی ئەندازیاری سیستەمی زانیاری

وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی باڵا- دکتۆرا

No.	Subjects	Topics	References
1	Advanced Computer Networks	1- Computer network and the Internet (Chapter 1 Ref 1) 2- Fundamentals of Ethernet LANs, WANs and IP Routing (chapter 2,3 ref 2) 3- Principles of VLANs (chapter 8, ref 2) 4- The Network Layer (chapter 4, ref 1) 5- IPv4 addressing (Part IV, ref 2)	1-Computer Networking: A Top-Down Approach, Jim Kurose, Keith Ross 2- CCNA 200-301

2	Advanced Object Oriented Program Programming	1-Class and method 2-Modifiers: Private, Default, Protected, Public 3-constructor for a class 4-Inheritance, type of Inheritance 5-Overloading and Overridden Methods 6-Static Polymorphism, Dynamic Polymorphism 7-Static Binding and Dynamic Binding. 8-Access Overridden Methods of the Superclass 9-Abstraction, Encapsulation, Association, Generalization, Aggregation, 10-Coupling and Cohesion 11- Interface: declare an interface, Static Method in Interface	1.Barry Holms, Daniel T. Jouse- Object oriented programming 2.Nell Dale, Chip Weems- Programming and problem solving with Java 3.Y. Daniel Liang- INTRODUCTION TO JAVA PROGRAMMING 4.https://www.javatpoint.com/java-oops-concepts
3	Advanced Database Management Systems	1-Introduction to Database Management System (Database and Database management system-Data base System Applications, Purpose of Database Systems, Advantages and Disadvantages of DBMS-View of Data – Data Abstraction – Instances and Schemas –data Models -Database Languages - DDL – DML – database Access for applications Programs – data base Users and	1- Database management systems / second edition (raghu ramakrishnan and johannes gehrke) 2- Fundamentals of database systems /fourth edition (ramez elmasri and shamkant b. navathe) 3- Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition

		Administrator – data base Architecture - the Query Processor - Storage Manager – Transaction Manager.	
		2- Conceptual Database Design - Entity Relationship (ER) Modeling (Database Design Techniques - ER Model -Entities, Attributes and Entity sets - Relationships and Relationship sets - Advantages and Disadvantages of ER Modeling - Relational Model- Database Schema- Keys–- Schema Diagrams.	
		3-Relational Algebra and Calculus (Relational Query Languages, Relational Operations. Relational Algebra – Selection and projection set operations – renaming – Joins – Division –Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus. Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries, Views, Triggers. Introduction to the Relational Model – Structure – Database Schema, Keys – Schema	

			Diagrams)	
			4- Normalization (Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyee /Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form)	
			5- Storage Management And Indexing: physical storage system, storage interface, magnetic Disk, flash memory, database storage architecture, file organization	
			6- Database System Architecture: centralized database systems, server system architectures, parallel systems, distributed systems and cloud-based services.	
4		Advanced data Communication	1- Sampling theory and Pulse Modulations It covers the sampling theory and related topics, Quantization and the process of digital transmission, and all types of pulse modulation. 2-Analog and Digital Modulations It covers all types of analog	1-Misra, Iti Saha. Wireless communications and networks: 3G and beyond. McGraw Hill Education (India) Pvt Ltd, Second edition, 2013. 2- A. Bruce Carlson and Paul B. Crilly, "COMMUNICATION SYSTEMS: AN INTRODUCTION TO SIGNALS AND NOISE IN ELECTRICAL COMMUNICATION", 5th Edition, 2010.

| | | and digital modulations, following are some examples but they are not all the types; AM, FM, PM, ASK, PSK, FSK, QAM, and so on.

3-Multiplexing and multiple accessing (multiuser) Technics

It covers all the types of multiplexing technics. Following are some examples but they are not all the types; TDM, TDMA, FDM, FDMA, CDM, CDMA.

4-Wireless Communication Channel

It covers the concept of the wireless communication channel, impairments and challenges in the wireless channel for example fading and multipath issues, Wireless channel characteristics,

5-Mobile and Cellular Communication Systems; GSM and LTE as examples.

It covers concept of mobile and cellular networks, GMS network, and LTE network as two examples of mobile networks. | 3- B. P. Lathi and Zhi Ding, "MODERN DIGITAL AND ANALOG COMMUNICATION SYSTEMS", 5th Edition 2019.

4- Bernard Sklar and Fred Harris, "DIGITAL COMMUNICATIONS: FUNDAMENTALS AND APPLICATIONS", 3rd Edition, 2020.

Note :

The mentioned references contain most of the topics that will be considered in the exam, however, any other reference can be used that contain the mentioned topics. |
| 5 | Advanced Mathematic | 1.Fourier Analysis (Fourier Series, Fourier Transform, Fast Fourier Transform)

2.Laplace Transform and Inverse Laplace Transform

3.Differential Equations

4.Numerical Analysis (Root Finding: Newton-Raphson, Secant, Bisection, Brent, | 1- Erwin Kreyzig, "Advanced Engineering Mathematics", 10th Edition, 2011.

2- Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers", 8th Edition, 2021. |

			etc.)
			5.Numerical Analysis (Solving System of Equations: Jacobi, Gauss Seidel, etc.)

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کۆلێژی تەکنیکی ئەندازیاری هەولێر / بەشی تەکنیکی ئەندازیاری رێگاوبان

وانەکانی تاقیکردنەوەی توانستی زانستی خوێندنی بالّا- ماستەر

References	Topics	بابەتە داواکراوەکان	ژ
Pavement Design Materials, Analysis, and Highways By: M. Rashad Islam and Rafiqul A. Tarefder	• Stress-Strain in Pavement • Soils and Aggregates and required tests • Asphalt Materials and mixture design methods • Portland Cement Concrete • Traffic surveying and analysis • Flexible Pavement Design AASHTO Guide 1993 • Rigid Pavement Design AASHTO Guide 1993 • Drainage system Design for Highways • Distresses in Flexible Pavement • Distress Models in Flexible Pavement • Flexible Pavement Design by AASHTO 2008 • Asphalt Overlay Design by AASHTO • Sustainable Pavement Design. • Pavement Rehabilitation	**Pavement Design**	**١-**

	Design and modern Technologies • Recycling and Maintenance of Pavement		
Principles of Highway Engineering and Traffic Analysis By: Fred L. Mannering & Scott S. Washburn	• The Transportation Planning Process • Selection of route location of Highways • Earthwork • Highway classification • Capacity and Level of Service for Highway Segment • Geometric Design of Highway; Design Controls and Criteria • Design of horizontal curves • Design of vertical curve	**Highway Geometric Design**	٢-
Traffic Engineering and Transport Planning By: Kadiyali, L.R. **Traffic Flow Theory and Control** By: Drew, D.R.	• Traffic Engineering • Traffic Engineering Studies and Analysis • Traffic Control Devices • Transportation Planning Process • Transport Surveys • Trip Generation and Distribution • Modal Split and Assignment • Transport Planning Modelling	**Transportation & Traffic Engineering**	٣-
Structural Concrete: Theory and Design By: M. Nadim Hassoun and Akthem Al-Manaseer	• Materials • Design of Concrete Structures and Fundamental Assumptions • Flexural Analysis and Design of Beams	**Reinforced Concrete Design**	٤-

	• Shear and Diagonal Tension in Beams • Two-way slabs • Short columns • Retaining walls • Staircases in buildings		

STRUCTURAL ANALYSIS
By: R. C. HIBBELER
	• Types of structures and loads
	• Stability and determinacy of structures
	• Analysis of statically determinate structures (beams and frames)
	• Analysis of Statically Determinate structures (Trusses)
	• Influence line for statically determinate structures (beams and frames)
	• Influence line for statically determinate structures (trusses)
	• Approximate analysis for statically indeterminate frames
	• Deflection of statically determinate structures
	  ➢ Conjugate beam method
	  ➢ Virtual work method
	  ➢ Castiglione's method
	• Analysis of statically indeterminate structures by the force method
	• Displacement
		Structural Analysis	٥‑

	method of analysis: slope deflection equations • Displacement method of analysis: moment distribution			