

Short Course Description

301501101 Arabic I; [3 Cr. H.]

تتضمن هذه المادة مجموعة من المهارات اللغوية بمستوياتها المختلفة في أصوات اللغة العربية وصرفها ونحوها وفي مستواها البلاغي ومستواها المعجمي ومستواها الكتابي وهي تشتمل إلى جانب ذلك على تطبيقات في استخدام المعاجم العربية، وتطبيقات على بعض المهارات الكتابية التي لا يستغني عنها الدارسون في حياتهم العملية، ولكي يتصل الدارسون بالنصوص العربية الراقية تضمنت هذه المادة تذوقاً لمجموعة من النصوص القرآنية والشعرية والقصصية.

301501102 Arabic II; [3 Cr. H.]

يهدف هذا المساق إلى تطوير مهارات الطالب الكتابية والتعبيرية وتزويده بالضروري والأساسي منها؛ ليوثفه في الاستخدام اليومي. ويتوصل إلى ذلك بالوقوف على نشأة الكتابة العربية، والإطلاع على نماذج متنوعة من الكتابة الفنية [Pre-Pre. Req. 301501101] والوظيفية قديماً وحديثاً.

301502101 English I; [3 Cr. H.]

Is a complete graded course for foreign learners of English; it covers the skills of listening, speaking, reading, and writing; as well as improving pronunciation and building vocabulary; particular emphasis is placed on listening and speaking; the language of the course is British English.

301502102 English II; [3 Cr. H.]

Is a continuation of English I Course in terms of approach and methodology. However, it covers a new range of interesting topics, and provides a more advanced grammar syllabus in a communicative context as well, therefore, this topic tends to be a continuation of ENGL 101 of goals. [Pre-req. 301502101]

301004101 Computer Skills I ; [3 Cr. H.]

An introduction to computing and the broad field of information technology. Topics covered include the basic structure of digital computer systems; operating systems; application software; data communication and networks; and the Internet hands-on learning emphasizes windows (latest operating systems); MS-Office; and the Internet.

303000100 National Education; [3 Cr. H.]

301506101 Military Science; [3 Cr. H.]

315505101 Mathematics I; [3 Cr. H.]

Differentiation and applications; complex numbers; analytical geometry; methods of integration; infinite series; power series; vectors in three dimensions; equations of line and plane in three dimensions; complex power series; complex integration.

315505102 Mathematics II; [3 Cr. H.]

Partial derivatives; optimization and its applications; Lagrange Multipliers; double and triple integrals; solutions of higher linear ordinary differential equations (ODE's); series solution of linear (ODE's); partial differential equations; wave and heat equations; Laplace transforms; Fourier series; methods of separation of variables. **[Pre-req. 315505101].**

315503101 Physics I; [3 Cr. H.]

Physics and measurements; vectors; motions in one dimension; motion in a plane; laws of motion; circular motion; Newton's laws and applications; work and energy; law of gravity ; linear momentum and collisions; rotation of a rigid object about a fixed axis; rolling motion; angular momentum and torque.

315503102 Physics II; [3 Cr. H.]

Electric charge and Coulomb's law; Electric fields and Gauss law; electric potential; potential energy, capacitors and dielectrics; DC and resistance; direct current circuits; magnetic fields; sources of magnetic field; Faraday's law; inductance; alternating current circuits; electromagnetic waves. **[Pre-req. 315503101]**

315503111 Physics I Lab; [1 Cr. H.]

Measurement and errors; vectors; rectilinear motion; projectile motion; Newton's second law; friction; collisions; circular motion; rotational motion; simple harmonic motion.

[Co-req. 315503101]

315503112 Physics II Lab; [1 Cr. H.]

Electric field mapping; Ohm's construction law; Wheatstone bridge; electric power; potentiometer; Kirchhoff's laws; charging and discharging circuits (R-C circuits); magnetic torque on a loop; Faraday's laws of magnetic induction; resonance in R-L-C circuits. **[Co-req. 315503102]**

315504101 Chemistry I; [3 Cr. H.]

Periodic table; atomic structure and chemical bonds; electron configuration; chemical stoichiometry; Redox-system; chemical equilibrium; thermodynamic; chemical kinetics; electro-chemistry.

315504111 Chemistry I Lab; [1 Cr. H.]

Physical properties; empirical and molecular weight determination; water of crystallization; determination; heat of neutralization and heat of formation; standardization of solutions; chemical analysis; rate of reaction; cell potential. **[Co-req. 315504101]**

315021201 Statics; [3 Cr. H.]

Statics of particles; rigid bodies; equivalent systems of forces; centroids and centers of gravity; analysis of structures: frames, machines, and trusses; friction; moments of inertia; principle of virtual work; computer-aided statics. **[Pre-req. 315505102 and 315503101]**

315004102 Computer Skills II; [1 Cr. H.]

Flow charts and problem solving, introduction to C++ programming, function, control, arrays and matrices, pointers, and expressions, file access, writing and debugging, C++ programs in lab. . **[Pre-req. 301004101]**

315022101* Engineering Workshops I; [1 Cr. H.]

Mechanical works including: hand filing, turning, welding, metal cutting, casting and molding, electrical circuits; elements of electrical circuits; open and closed circuits; AC/DC circuits; instruments and measurements.

315022102 Engineering Workshops II; [1 Cr. H.]

Electrical installations including: plans, equipment, protection, motor and machine installations; carpentry works including: types of timber, timber works, equipment and tools, painting and finishing.

315022203 Engineering Drawing; [3 Cr. H.]

Use of instruments; lettering; graphic geometry; orthographic; isometric drawing and sketching; sectional views; computer aided design; applications in civil, mechanical, architectural and electrical engineering. **[Pre-req. 301001101]**

315021202 Strength of Materials; [3 Cr. H.]

Mechanical properties of materials; stresses and strains in members subjected to tension, compression, and shear; torsion stresses; flexural and shearing stresses in beams; combined stresses; transformation of stresses and strains; deflection of beams; buckling of columns. **[Pre-req. 315021201]**

315021204 Strength of Materials Lab; [1 Cr. H.]

Strain gages and their applications; response of materials under tensile, compressive, flexural, and torsion loading; surface hardness of materials; impact test. **[Co-req. 315021202]**

315021231 Surveying; [3 Cr. H.]

Introduction; field notes and data collection; errors and adjustment; surveying instruments and calibration of instruments; linear measurements including Electronic Distance Measurements (EDM); angular measurements; leveling; areas and volumes; traversing; triangulation; photogrammetry

315021233 Surveying Lab; [1 Cr. H.]

Practical exercises in field surveying covering linear measurements and EDM; angular measurements;

leveling; areas and volumes; traversing; triangulation; photogrammetry. **[Co-req. 315021231]**

315021272 Concrete Technology; [3Cr. H.]

Introduction; aggregates of concrete; cements; mixing water; additives; concrete industry; properties of wet and hardened concrete; testing of concrete; mix design; hot and cold weather concreting; quality control of concrete; special concrete.

315021274 Concrete Technology Lab; [1 Cr. H.]

Cement and mortar tests; aggregate testing; testing of fresh and hardened concrete; nondestructive testing of concrete. **[Co-req. 315021272]**

315022202 Numerical Techniques; [3 Cr. H.]

Error analysis; roots of equations; matrices; solution of simultaneous linear and non linear systems of equations; interpretation and curve fittings; numerical differentiation and integration; differential equations; computer applications. **[Pre-req. 315505102 and Co-req. 301004102]**

315021305 Applied Statistics; [3 Cr. H.]

Randomness; introduction to probability theory and probability distributions; discrete and continuous probability distributions; univariate analysis; decision theory (Bays' theorem); hypothesis testing; confidence intervals and tolerance limits; correlation; regression analysis; analysis of variance; time series; nonparametric methods. **[Pre-req. 315505102]**

315021311 Structural Analysis I; [3 Cr. H.]

Introduction to structural analysis; loads: static, environmental and dynamic loading; classification of structural elements; stability and determinacy of structures: determinate trusses, cables, beams and frames; influence lines of beams, frames and trusses; deflections in elementary structures; introduction to

virtual work. **[Pre-req. 315021202]**

- 315021312 Structural Analysis II; [3 Cr. H.]**
Statically indeterminate structures; method of consistent deformations; slope-deflection method; three moment equation moment distribution method; introduction to matrix structural analysis. **[Pre-req. 315021311]**
- 315021316 Reinforced Concrete Design I; [3 Cr. H.]**
Materials properties; reinforced concrete members subjected to axial loads; flexural analysis and design of beams (Ultimate and Working stress design); design for shear and diagonal tension; bond, anchorage and development length; short and slender columns under compression combined with moment (interaction diagrams); design of slabs.
[Pre-req. 315021311 and 315021212]
- 315021321 Transportation Engineering; [3 Cr. H.]**
Transportation systems; transportation system and elements; motion equations; introduction to traffic signals; traffic flow theory; alternative evaluation; capacity and level of service concept; transport demand forecasting ; transit system; environment impact. **[Pre-req. 315021231]**
- 315021342 Hydraulics [3 Cr. H.]**
Hydrologic cycle; stream flow; floods and flood damage mitigation; groundwater flow; hydraulic applications for transmission facilities. **[Pre-req. 315022222]**
- 315021351 Applied Geology; [2 Cr. H.]**
Earth sciences in civil engineering; external and internal processes; plate tectonics; minerals; geological structures; engineering properties of rocks; geological maps; ground water; geology of tunnels, roads, bridges and dams; geological surveying methods.
- 315021353 Applied Geology Lab; [1 Cr. H.]**
Geological maps; profiles; study of crystals; collection of mineral and rocks; physical properties of rocks: color, luster, hardness cleavage, and specific gravity. **[Co-req. 315021351]**

- 315021355 Soil Mechanics; [3 Cr. H.]**
Introduction to soil mechanics; formation and structure of soil; physical properties; determination of index properties, identification and classification of soil; permeability; seepage flow; stress distribution; consolidation; shear strength; compaction; earth pressure; stability of slopes. [Pre-req. 315021202]
- 315021356 Soil Mechanics Lab; [1 Cr. H.]**
Specific gravity; moisture content; liquid, plastic, and shrinkage limits; consolidation test; sieve analysis; site density; compaction test; California Bearing Ratio (CBR); permeability; Shear strength of soil (direct shear, unconfined and triaxial tests). [Co-req. 315021355]
- 315021212 Structural Drawing; [1 Cr. H.]**
Introduction; primary structural plans: topographic and site plans; reinforced concrete buildings plans; bridge plans; detailing of: footings, columns, slabs, beams sections, stairs; mechanical and electrical plans; detailing of steel structures; computer aided drawing. [Pre-req. 315022203]
- 315021415 Reinforced Concrete Design II; [3 Cr. H.]**
Serviceability of beams and one-way slabs; continuous beams and frames; loading patterns; moment envelopes; moment redistribution; design for torsion, torsion plus shear; design of slabs; two-way column supported slabs (direct design method, equivalent frame method); design of staircases, design of slabs on grade. [Pre-req. 315021316]
- 315021417 Design of Steel Structures; [3 Cr. H.]**
Introduction; specifications, loads and methods of design; analysis and design of tension and compression members; design of beams for flexure, shear, and torsion; analysis and design of beam-columns; bolted and welded connections. [Pre-req. 315021311]

315021421 Highway Drawing; [1 Cr. H.]

Contour maps; corridor selection; cross-section elements; curves for horizontal and vertical alignments; superelevation attainment; drainage facilities (pipes and culverts); traffic signs and marking; intersections and interchanges; reading and executing highway plans, computer aided drawing. **[Pre-req. 315021429]**

315021424 Highway & Airport Pavement Design; [3 Cr. H.]

Types of pavements; stress analysis in flexible and rigid pavements; traffic load forecasting and analysis; effects of environment and climate on pavements; pavement distresses; design of flexible and rigid pavement for highways and airports; pavement materials; economic analysis and optimization of pavement alternatives; computer applications. **[Pre-req. 315021427]**

315021426 Highway & Airport Pavement Lab; [1 Cr. H.]

Experimental testing of highway materials using destructive and nondestructive methods, properties of asphaltic materials and related tests; Marshal test. **[Co-req. 315021424]**

315021427 Highway Engineering & Geometric Design; [2 Cr. H.]

Geometric design concepts for highways and railways; design control and criteria; sight distance; horizontal and vertical alignment; cross-section elements; super elevation attainment; earthwork computations; mass hand diagram; highway types; at grade-intersections;

types of interchanges; grade separations and clearance; drainage design ;computer aided design.
[Pre-req. 315021231]

315021428 Traffic Engineering; [3 Cr. H.]

Traffic engineering techniques, traffic studies; traffic safety; capacity analysis of interrupted and uninterrupted flows; traffic signal coordination; introduction to queuing theory; computer applications in traffic. **[Pre-req. 315021321]**

315021429 Geometric Design Lab; [1 Cr. H.]

Practical applications that reflect the concepts of highway geometric design, including the layout of different types of horizontal and vertical curves, such as simple circular curve, transition curve, compound curve, sag vertical curve, crest vertical curve.

[Co-req. 315021427]

315021452 Foundation Engineering; [3 Cr. H.]

Site investigation; foundation classifications; bearing capacity; foundation settlement; factors affecting foundation design; spread footing; special footing; beams on elastic foundations; mat foundations; lateral earth pressure and retaining walls; pile foundations.
[Pre-req. 315021316 and 315021355].

315021551 Construction Equipments and methods; [3 Cr. H.]

Basic construction technology including equipment and methods; soil stabilization; earth work operation; concrete operation; rigid pavement; formwork types; concentrating methods; asphalt operation; owning and operating cost; occupational safety management.

315021464 Construction Management; [3 Cr. H.]

Construction Management system; critical path method (CPM); Program evaluation & review techniques (PERT); resource allocation; time cost trade-off; organization; construction contracting. **[Pre-req. 315021362]**

315021511 Rehabilitation of Structures; [3 Cr. H.]

Rehabilitation concept; evaluation of existing structures; strength durability and deficiencies; evaluation procedures; destructive and non-destructive testing; damaged structures and deterioration mechanisms; criteria and techniques for repairing and strengthening of structures. **[Pre-req. 315021316 and 315021417]**

315021512 Bridge Engineering; [3 Cr. H.]

Types of bridges; material properties; loads on bridges; design of bridge slabs; design of reinforced and prestressed concrete bridges; T-beams; box girder bridges; design of steel bridges; substructure design. **[Pre-req. 315021316 and 315021417]**

315021513 Computer Applications in Highway and Bridge Engineering; [3 Cr. H.]

Practical applications using civil engineering computer software including structure, transportation, soil, and

management. **[Pre-req. 315021417 and 315021428]**

315021515 Matrix Structural Analysis; [3 Cr. H.]

Basic concepts of matrix method in structural analysis; the direct stiffness method applied to trusses and frames; force and displacement transformations; assemblage of stiffness and flexibility matrices; computer applications in structural analysis. **[Pre-req. 315021311]**

315021517 Seismic Hazard Analysis; [3 Cr. H.]

Concept of seismic design; analysis of earthquake effects; choice and design of earthquake resistance systems; the behavior of reinforced concrete under cyclic loading; design of shear walls; codes of practice. **[Pre-req. 315021312* and 315021417]**

315021518 Prestressed Concrete; 3[Cr. H.]

Introduction; prestressed concrete concepts and materials; detailed estimation of losses, design for flexure; design for shear and torsion; slab design; design of disturbed regions; indeterminate beams and frames. **[Pre-req. 315021415]**

315021522 Highways Rehabilitation and Management; [3 Cr. H.]

Introduction to pavement management process; pavement networks definitions and classifications; pavement distress survey and rating procedure; deflection; roughness, skid resistance; overview of maintenance and rehabilitation techniques; network level management; project level management. **[Pre-req. 315021424]**

315021527 Public Transportation; [3 Cr. H.]

Role of public transportation; urban passenger transportation modes; estimating public transit demand (quick response methods, computational techniques); highway transit systems; rail transit networks; paratransit systems. **[Pre-req. 315021428]**

315021528 Airport Engineering; [3 Cr. H.]

Principles; planning and design of airports; aircraft characteristics; site selection; demand analysis; airport configuration, runway design; design of terminals; airport pavement design; airport drainage; marking and lighting. **[Pre-req. 315021427]**

315021529 Urban Transportation Planning; [3 Cr. H.]

Transportation planning studies and methods; land use and zoning; sequential demand forecasting models; traffic impact studies: air quality, noise and energy; evaluation of transportation and decision making; intermodal transportation. **[Pre-req. 315021428]**

315021555 Engineering Hydrology; [3 Cr. H.]

Meteorological data; precipitation; evaporation and transpiration; infiltration and percolation; ground water; surface runoff; hydrographic analysis; flood routing; hydrological forecasting; design criteria.

315021562 Quantity Surveying Specifications & Contracts; [3 Cr. H.]

Bidding and contracting; specifications of: concrete works finishing; highways; quantities' surveying (Earth works, buildings, highways, concrete and steel bridges). **[Pre-req. 315021231, 315021212]**

- 315021581 Special Topics in Highway and Bridge Engineering; [3 Cr. H.]**
 Selected topics in highway and bridge engineering taught by faculty members. . **[Pre-req. or Co-req. will be decided by the Department based on the selected topic].**
- 315020201 Electrical Engineering; [3 Cr. H.]**
 Charge and matter; A.C. and D.C. circuits; single and 3-phase circuits; electrical machines; transformer protective devices; electronic principles; diodes; transistors; instruments of measurement. **[Pre-req. 315503102]**
- 315020204 Electrical Engineering Lab; [1 Cr. H.]**
 Ohms and Kirchoff's laws; oscilloscope; transformers; induction motors; and electronic devices; diodes and transistors. **[Co-req. 315020201]**
- 315022222 Fluid Mechanics; [3 Cr. H.]**
 Fundamentals of fluid mechanics; hydrostatic and continuity principles; energy and momentum principles; forces on emergent bodies; laminar and turbulent flows in closed conduits; applications of fluid mechanics involving pressurized flow; open channels and pumps. **[Pre-req. 315021201]**
- 315021362* Engineering Economy; [3 Cr. H.]**
 Engineering works and project; feasibility studies and decision making; basic concepts of time value of money and equivalence; formulas notations and applications of interest ; comparison of engineering alternatives (net present worth, equivalent uniform annual worth; rate of return and benefit-cost ratio methods); depreciation; taxation
- 315022311 Dynamics; [3 Cr. H.]**
 Kinematics and kinetics of particles and systems of particles with applications to central force motion, impact and relative motion, single-degree of freedom free and forced vibration, dynamics of rigid bodies,

relative motion, and gyroscopic motion; structural dynamics, computer applications. **[Pre-req. 315021201]**

315021526 Traffic Safety [3 Cr. H.]

Introduction to traffic safety; Driver Behavior; safety management process and systems; safety countermeasures; crash reporting; highway geometry and safety; road safety audits; crash investigations and analysis. **[Pre. Req. 315021428]**

315021572 Building Construction [3 Cr. H.]

Site investigation; concrete and reinforcement; foundation; walls; columns; beams and slabs; stairs; formworks; steel structures; floors; plastering; paints; doors and windows; insulation; joints; electrical installations.

315021595 Training; [6 Cr. H.]

Every three credit hours equivalent to (140) hours of field training.

315021597 Project I; [3 Cr. H.] [Pre-req. the student should pass 120 Credit hours]

315021598 Project II; [3 Cr. H.] [Pre – req. 315021597]