TECHNION INTERNATIONAL
Israel Institute of Technology

Technion Israel Institute of Technology

Technion International

Spring Semester 2020/21

Course Syllabi

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014601 Project I - Construction management

The Project Is a Guided Assignment Which the Student Carries Out to Solve a Real-Life Problem in the Field of Construction Management. There Are Three Project Options: a. Construction Planning of a Building Project, Which Includes a Selection of the Construction Method and Equipment on the Basic of the Analysis of Alternatives, and Preparation of Site Layout, of Schedule and Budget for Construction. B. Development of a Construction Venture, Which Includes Market Study, Development of Investment Alternatives, Preparation of Cash Flow for Each of Them, Selection of the Most Attractive One and a Sensitivity Analysis. C. Application of Automation to a Construction Task, Which Includes the Selection of the Task, Application Planning, Development of Software Or Hardware and a Feasibility Analysis.

Contact hours
Recitation: 2 hours

Credit points: 2.5

015017 Earthmoving Equipment & Systems

Course Objectives

Development of equipment and methods in earthmoving as a factor in civil engineering, agricultural and mining projects. Properties of moved soil and rock. Power and forces for excavating and earth

hauling. Machine components and their performance: diesel engines, power-trains, tracks and tires. Equipment application and production: rippers, excavators and shovels. Levelling equipment. Principles of soil compaction, selection of rollers. Mass-haul diagrams and their interpretation. Machine loading and handling analysis in equipment operation and earth-works. Safety in earthmoving.

Contact hours

Lecture: 2 hours

Recitation: 1 hours

Credit points: 2.5

015017 Human Resource Management in Construction

Course Objectives

a- To enhance the students' understanding of their future managerial role, with emphasis on the management of the human resources and with a multi-cultural perspective.

b- To learn about theories and practical tools applied when working with and/or managing human resources inside and outside of the construction industry.

Course Content

The course focuses on two main knowledge areas: a- soft aspects of management: primary HRM activities, motivation, change management, communications, teamwork; and b- the construction industry: its characteristics and various players; the players' roles, functions and interactions in the delivery of construction projects.

Contact Hours

Lecture: 2 hours

Recitation: 1 hour

Credit points: 2.5

016203 Water resources systems engineering

Lecture Topics

- Mathematical models of water resources systems
- Selection of models for optimization and simulation
- Model structures
- Objective functions
- Formulation of optimization and simulation models
- Methods of solution
- Examples, including: development of surface water, aquifer management, design and operation of distribution systems

Contact Hours

Lecture: 2 hours

Recitation: 1 Hour

Credit points: 2.5

014615 Introduction to financial management

General Course Description

The course will impart basic and advanced concepts in financial accounting and management, such that the student will be able to understand and analyze a financial report, especially in areas related to real estate.

Weekly Lecture Topics

1. General introduction and accounting principles.
2. Principles of accounting records and different depreciation methods.
3. Types of business and economic models.
4. Structure of a financial report, balance and profit & loss reports.
5. Counting, taxation and funding in real estate.
6. Cash flows.
7. Analysis of financial reports, cost of capital, financial stability and leverage.
8. Worthwhileness of investments given risks and lifecycle costs.
9. Different topics.

Prerequisites

014603 – Engineering Economics
014606 – Introduction to Construction Management

Contact Hours

Lecture: 2 hours

Recitation: 1 hour

Credit points: 2.5

016302 Air pollution

Lecture Topics

Primary air pollutants – sources and effects.
Physical and chemical properties of aerosols.
Secondary pollutants, photochemical reactions, formation and removal of gasses and particles.
Global air pollution, meteorology of air pollution.
Evaluation and monitoring of ambient air: air pollution control – administrative and technological aspects.

Contact hours
Lecture: 2 hours

Recitation: 1 hours

Credit points: 2.5

014841 Fundamentals of Mapping and Surveying 1

Course objectives:

Basic concepts in surveying, mapping and geodesy. Basic issues in the theory of errors. Geodetic coordinates systems. The theodolite and angle measurements. Ordinary leveling. Total station. Calculation of volumes and areas. Geodetic information sources: terrestrial measurements, aerial photographs, satellites (GPS) and remote sensing

Teaching method:

• **Lecture** 2 hours per week attendance is obligatory.
• Two hours of **exercises** per week.
• Non-participation in the exercises without prior permit will result in the cancellation of the registration for the course.
• During the exercises home work will be given (Obligation submitting homework).
• Each student should bring a calculator to the exercises.
• The exercises are 10% of the grade.
• Two hours of **labs** per week. Participating in laboratories is obligatory.
• Preparation for the lab by following the instructions on the site.
• Required equipment for the labs: notebook, calculator, drawing tools and preparing report.
• The lab exercises are 20% grade.

• Necessary condition to pass the course is passing grade in each of the lab exercises.
• A student absent from any lab would have to complete the missing lab towards the end of master.
• Practical test will be held at the last week of the semester.
• Necessary condition to pass the course is to pass the practical test.

Exam and grades:

• Mid-term exam – 20% of the grade (9.5.21). • Final exam – 27.6.21- 50% or 70% of the grade, date, contains all the material taught in lectures, exercises and labs (During the final lecture).
• The mid-term exam and the final exam will be with closed material.
• Equation pages will be given with the exams.
• Students, who receive at the final exam a grade lower than 50, should do second term exam (23.7.21) or repeat the course again.

014606 Introduction to Construction Management

Purpose of the Course:

To become familiar with the functioning of the construction industry and understand the basic techniques of managing a construction project from inception to completion.
This course creates the foundation for students' career in construction management. It is important to listen to the lectures, pay attention during recitations and store the knowledge acquired in your "long term memory". Many of the concepts that will be taught are not written in textbooks.

Help Material

Most of the material is available on the course Moodle site.

Course Tasks

This is an introductory course; therefore, it is composed of many topics. For each topic, only a one-two week period is designated to teach the topic—thus it is incumbent on the student to take an active and continuous role in his/her tasks, which are now enumerated:

1. Lectures: During lectures, most of the theoretical and deep understanding of the material is presented. This is important as management is not a set of formulas but a thought process. The exam will test this material.

2. Recitations: Each week there will be a two-hour recitation on a topic. It is highly recommended that students come to the recitations, although attendance is not mandatory.

3. Homework (HW): The total weight of the homework is **5%** of the final grade. Turning in HW is mandatory and a student who does not turn in at least three of the of the homework **will not pass** the course. **Students are to submit exercises in pairs.**

4. Project: During the semester a summary exercise will be assigned that will encompass all the material taught in the course. It is designed to encourage students to look at the material as a holistic process. It is worth **20%** of the final grade – **only if the final exam grade is above 65.** Students will submit the exercise in pairs. Submission of the exercise is a **requirement to pass the course.**

5. Self-Learning: Students may be required to do some self-learning from materials provided on the Moodle site. If this is the case, either the lecturer or the TA will give explicit instructions.

6. Individual Assignments: Throughout the course individual assignments will be handed out that relate to the course material. Each assignment is worth **5%** of the final grade.

7. Final Exam: A final exam will be given at the end of the semester worth **75% (or 95%)** of the final grade. As student who does not achieve at least a **55%** on the final exam will **not pass the course even if the student's total grade is above a 55.**

14008 Graphical Engineering Information

14214 Fundamentals of Fluid Mechanics

114052 Physics 2

Course Objectives and Targets

1. Introduction to electrostatic and magnetostatic phenomena.

2. Developing basic understanding of electric DC and AC circuits and also electric appliances, such as transformers, and engines.

3. Introduction to mechanical and electromagnetic waves and wave phenomena, such as interference and diffraction.

Weekly Lecture Topics

1. The electric charge (discrete and continuous) and Coulomb's law. Superposition. Polarization and charging by induction. The electric field. Vector field representations. Motion of a charged particle in an electric field

2. Electric flux and Gauss' law. Electrostatic potential energy, and the electric potential. Calculation of the electric field from the potential

3. Equipotential surfaces. Fields around and inside conductors. Electrostatic shielding. Leiden jar. High-Voltage breakdown, Lighting and Sparks

4. Capacitance and capacitors. Electric energy density. Dielectrics

5. Currents, resistivity and Ohm's law. Batteries, electromotive force, electric circuits, Kirchhoff's laws, RC circuit. Power. High voltage power lines

6. Magnetic field, Lorentz force, torques, electric motors (DC)

7. Motion of a charged particle in a magnetic field: cyclotron and mass spectrometer

8. Ampere's law. Bio-Savart law. Gauss' law for magnetic field

9. Faraday's law of induction and non-conservative fields. Eddy currents and magnetic breaking. Inductance. Self-inductance. RL circuit

10. Transformer and magnetic energy density. RLC circuit, AC current. Synchronous and induction motors

11. Magnetic materials. Dia-, Para- and Ferromagnetism. Displacement current, and Maxwell equations. Part 2: Waves

12. Derivation and analysis of the wave equation. Amplitude, velocity, polarization, periodic waves – frequency/period and wavelength/wavenumber

13. EM waves: Poynting vector, Doppler effect. Wave adding, beats, standing wave

14. Interference, Young's experiment, Newton rings, Huygens' principle. Diffraction grating, resolution. Single-slit diffraction, double-slit diffraction. Snell's law, total reflection

Prerequisite

114051 – Physics 1

Contact hours

Lecture: 3 Hours

Recitation: 1 Hour

Credit points: 4

014005 Civil Engineering Laboratory Syllabus

Course Goal:

1. Visually and practically demonstrate principles learned in engineering mechanics and engineering of material courses.
2. Practice structures and specimen component experiment methods, use of measurement devices, registering and analyzing measurement results.
3. Developing an understanding of the factors that affect measurement inaccuracies and compatibility between measured and calculated parameters (according to theory), measurement results distribution meaning.
4. Practice data representation and analysis and preparing technical documents.

Formalities

1. Participating in all experiments during the time they are delivered is obligatory. The student's responsibility is to validate the course time does not contradict any other course time frame.

2. Safety regulations must be followed according to lab staff directives. Closed shoes are a must and smoking is prohibited.
3. At the end of each experiment the equipment must be returned, devices and specimen models should be restored to their original (pre-lab) state. The data gathered during the laboratory must be signed by the instructor. Reports should be handed in only with the signed data sheet.
4. A written technical report will be handed in a week after the experiment was conducted. The submitted report can be conducted in pairs (usually the experiments will be conducted in pairs; each pair will submit one report per lab). A late submittal will result in grade reduction. An experiment without a submitted report will be considered as if it was not conducted. Reports will be returned at the end of each experiment cycle (see lab schedule).
5. Experiment absence: **All the experiments must be conducted by the student for completing the course**. A supplemental lab to re-do un-accounted experiment due to illness will be given. The student is responsible for proving irregular absenteeism causes. A supplementary lab will not be possible for more than two experiments, even when justified reasoning. Supplementary labs are conducted at designated dates. A formal request will be handed to the lab instructor for the supplemental lab at the earliest possible occasion and in any case no later than one week prior to the designated lab date. A student intending to undergo a supplemental lab must fully prepare in advance prior to his arrival. **During the supplemental lab no instruction will be given by the instructor.** Supplemental labs are conducted on an individual basis, students are not paired. Experiments conducted on the supplemental labs will require an extensive report that include the theoretical background and well as the preparation report as described below. This will be handed to the instructor prior to supplemental experiment initiation.

Test Procedure
Each experiment is conducted at groups of up to 12 students which are divided into subgroups. The length of the experiment is up to 3 hours. The first hour is devoted to a discussion regarding lab preparation, to a short captioned review by the instructor that describes the experiment, the theoretical background, method of experiment conduct and the particulars of the lab report (general instructions are described below). The theoretical background and the experiment layout are included in the lab manuals which are supplied to the student via the internet (Moodle). The students must arrive prepared for the experiment and be equipped with the appropriate lab manual. The manual experiment procedures must be followed throughout the experiment. The experiment is usually conducted in pairs under the instructor supervision. During the experiment various measurements are conducted and results must be registered in an orderly manner (tabulated). Also simple calculations should be conducted in order to make sure the results are reasonable. **At the end of each experiment the equipment must be returned, devices and specimen models should be restored to their original (pre-lab) state. The data gathered during the laboratory must be signed by the instructor.**
Supplementary Material
Lab manuals and additional materials are available in PDF files, in the internet website. The web site includes, on top of the lab manuals, the syllabus, course schedule, and a file that includes various questions on the experiments in a similar format to final exam questions. Administrative messages like special occasions and schedule changes will be posted on the course web site and its student forum. It is the student responsibility to follow the posted instructions and act accordingly.

Pre-lab preparation and the Lab entrance quiz
Prior to each lab the lab manual must be read. At the beginning of each lab a 5 minute quiz will be held. The quiz will include 5 multiple choice **questions** with a closed books/ closed notes policy. A student that will answer less than 3 questions correctly will not be permitted to participate in the lab. The purpose of the quiz is to verify the student is familiar with the theoretical background of the experiment way of conduct.

Lab Report Preparation Methodology
The report will be prepared in groups within each student subgroup (the experiment is usually conducted in pairs, each pair will hand in one mutual report) according to the required posted lab report format as it appears on the web site for each lab. **Graphs will be handed in on a checkered paper and we won't receive computerized drawings.** Main body of work in the report include data representation, its analysis, and results

calculations. A clear and concise representation should be given precedence according to the following guidelines:
1. Graphs. All data, results, and calculations that were derived from the graph will be represented on it (i.e. calculation based on the graph slope).
2. Tables. All data and required calculations will be displayed in tables with general headers and clear concise columns headers.
3. Text. A concise text will include required explanations based on each experiment (i.e. explanations way the results do not match expectations).

Main Report Sections

1. Introductory Page. Include the name if the experiment, date, name of the student and their lab partner.
2. Experiment Description. A general concise description. One sentence that describes what was tested and what was the included instrumentation. Besides of the actual description explanations should be included for any abnormalities like experiment failure, unreasonable results, etc.
3. Results representation. **This is the important part of the report.** Display the measurements and calculation in a table or tables, construct graphs as required with associated calculations. The tabulated calculations will include a statistical analysis (averaging and standard deviation). In cases when the analysis includes an analytical calculation versus empirical result comparison the table will include a percentage error deviation calculation as well.
Remark: The questions that appear on the web site can be indicative to the way results and tabulated calculations should be displayed.
Units: Units should be applied to any measured or calculated parameter. All units will be under International System of Units (SI) (abbreviated SI from French: Système international d'unités) (Mass-kg, Force-N, Length-m, etc.). If actual measurements are performed in other units, these units should be converted to SI units.
As indicated above the graphs should be hand drawn on a checkered paper (it is required to add computerized graph as well). The direct practice of drawing and judging graph is one of the course goals. Emphases clear
Second Series

First Series
5. Rod Buckling
6. Strain Rosette and Mohr's Circle
7. Shear Center/ Sloped Bending
8. Influence Lines
1. Material Properties
2. Shear in Bending
3. Photoelasticity
4. Strain Gauges and Dynamometer Calibration

distinguishable lines while you draw with various colors when more than one curve is drawn. Include units on the ordinance and the abscissa axis. Measurement points should be marked in a clear bolded manner:
If the experiment includes several sections (a number of different tests) it is required to display each section separately with its own tables, graphs, and appropriate clear headers. If the instructions require additional explanation to be produced (i.e. reference to the nature of the results and compering them to some calculation) these explanations will be given to any part of the experiment (if more than one) at its end, after the results were presented. The explanations should be clear and concise with relevant headers.
4. Summery and results evaluations. It is required to refer to the results accuracy and reliability and try to explain deviations from expected results or their wide distribution. An experimental measurement is not an exact science and judgment should be practiced when results are evaluated.
5. Additional demands. Based on the instructor guidance and the lab guidelines (i.e. some experiments demand certain calculations based in measurements and data points handed by the instructor).
6. Appendices. Add the measurements data page (signed by the instructor). The original should be photocopied and kept by lad partners.

Course Grade Composition

The course grade is composed from a progress grade -40%, lab preparation and pre-lab quiz grade- 20%, and the final exam grade- 40% (a grade of 55 must be achieved). The progress grade reflects of the instructor's student

evaluation with respect to the student's attitude toward the lab (active participation, attendance, report quality). A final exam example questions appear at the course web site in Moodle.

References

The following is a list of general references. Specific references can be found in the lab guidelines.

1. Popov, E.P., Nagarjan, S. and Lu, Z.A., *Mechanics of Materials*, 2nd. ed., Prentice Hall, London, 1978.
2. Shames, I.H., *Mechanics of Deformable Solids*, Prentice-Hall, 1964.
3. Grover, R.L., *Mechanics of Solids*, John Wiley, 1964.
4. Hetényi, M., editor, *Handbook of Experimental Stress Analysis*, John Wiley, N.Y., 1950.
5. Hendry, A.W., *Elements of Experimental Stress Analysis*, Pergamon Press, 1977.
6. Godden, W.G., *Demonstration Models for Teaching Structural Mechanics*, University of Illinois Bulletin, 1963.
7. Cowan, H.J., *Building Science Laboratory Manual*, Applied Science Publishers, 1978.
8. Linear Regression Tutorial, Clemson University, 2006, http://phoenix.phys.clemson.edu/tutorials/regression/index.html
9. Experiment Resources (2009). Statistics Tutorial. Retrieved 27.02.2010 from Experiment Resources: http://www.experiment-resources.com/statistics-tutorial.html

014108 Statics of Structures

Course Topics

- **Statically determinate plane structures**
  Force and moment diagrams
  Virtual work and elastic deflections
  Influence lines
- **Statically indeterminate plane structures**
  Degree of indeterminacy
  Force and moment diagrams via flexibility and stiffness methods
  Elastic deflections
  Influence lines

Textbooks

- McCormac J. (2007) Structural Analysis: A Classical and Matrix Approach. John Wiley & Sons Inc. (There are various copies of this book in the library reserved only for Technion International)
- Rossow, C.E. (1999) Analysis and Behavior of Structures. Prentice Hall. New Jersey.
- Laursen, H. I. (1988) Structural Analysis. McGraw-Hill. New York
- Ghali A., Neville AM, TG Brown (2009) Structural Analysis A Unified Classical and Matrix Approach. Spon Press

Grading Plan

- Final Exam – 64%-92%
- Midterm Exam – 20% (or 0%)
- 4 Quizzes – 8-16% (4% each quiz; in total 8% MAGEN)

Notes: (1) The final exam grade must exceed 55 in order to pass the course; (2) midterm exam grade will be taken into account only when its grade is higher than the final exam grade ("MAGEN"); (3) there will be 4 quizzes throughout the semester during the workshop hours. 2 lowest quiz grades are MAGEN (8%), highest 2 (8%) will be taken into consideration anyway.

Teaching Method

- Frontal lectures (2 hours a week)
- Guided independent/group work during workshops (2 hours a week)
- Personal work at home

Attendance is recommended but not mandatory

List of Lectures

1. Introduction; Elastic displacements in trusses [19/3]
2. Elastic displacements in Beams and Frames (Mohr integral); Vereschagin's integral [26/3, 4 hrs.]
3. Displacements due to non-mechanical loads [2/4]
4. WS instead of lecture [16/4]
5. The degree of static-indeterminacy and the flexibility method [30/4]
6. The flexibility method with non-mechanical loads, and displacements in indeterminate structures [7/5]
7. Exploiting symmetry [14/5]
8. Stiffness method – Orthogonal [21/5]
9. Stiffness method – General [28/5]
10. Influence lines – Static method [4/6]
11. Influence lines SDS – Kinetic method [11/6]
12. Influence lines SIS – Kinetic method [18/6]
13. Course overview [25/6]

List of Workshops

1. Intro to mechanics – diagrams and elastic lines [19/3]
2. Lecture instead of WS [26/3]
3. Displacements in SDS due to forces [2/4] **Q1**
4. Displacements in SDS due to forces and non-mechanical loads [16/4, 4 hrs.]
5. Midterm [30/4]
6. The flexibility method (forces only) [7/5] Q2
7. The flexibility method [14/5]
8. Exploiting symmetry [21/5]
9. Stiffness method – Orthogonal [28/5] **Q3**
10. Stiffness method – General [4/6]
11. Influence lines – Static method [11/6]
12. Influence lines SDS – Kinetic method [18/6] **Q4**
13. Influence lines SIS – Kinetic method [25/6]

List of Quizzes [10-20 minutes long, will be held at the beginning of the WS]

- Q1 [2/4] – Mechanics – M, S, N diagrams, Elastic curves
- Q2 [7/5] – Displacements in SDS
- Q3 [28/5] – Flexibility method and/or symmetry
- Q4 [18/6] – Stiffness method and/or symmetry

Note that quizzes dates may be subjected to change. In case of a change, students will be notified in advance.

Exams

- Midterm exam [30/4, at the time of the WS]
- Final Exam (A) [11/7]
- Final Exam (B) [4/8]

Note that all dates are [day/month]
Course plan might be subjected to changes.

Bulks
Bulk 1 – weeks 1 to 4
Displacements in statically determine structures
Bulk 2 – weeks 5 to 7
The flexibility method
Solving indeterminate structures
Bulk 3 – weeks 8 to 10
The Stiffness method
Bulk4 – weeks 11 to 13
Influence lines

Workshops

- The workshop session will allow the students to work in groups with the objective of actively applying the technique taught in the lectures.
- The students will be able to analyze problems or difficulties in groups.
- The group participants will be able to share their experience and ideas.

The format of the workshop

- Each session will begin with examples of solutions and review of the technique (30-50 minutes), followed by group work of the students. The groups will get help and guidance as needed. Yet, students are encouraged to first try to tackle the problems on their own, then consult with the group, and then use the teacher to clarify.
- The students will be working in groups of 2-4 students.
- During the workshop, the groups will start working on the exercises listed in the WS sheet.
- In the case of questions/problems that affect most of the class, the issue will be addressed on the board.
- During the workshop students are encouraged to solve at least one of the problems completely, and then continue to review the rest of the exercises in order to detect potential difficulties so that these can be addressed in the group.
- Students are encouraged to complete the rest of the exercises at home.

036087 Hybrid Dynamics in Mechanical Systems

Description:

Analysis of Mechanical and Robotic Systems with Multiple Unilateral Frictional Contacts. Contact Kinematics and Contact Forces, Coulomb'S Friction Model, Statics-Graphical Methods, Formulating Dynamics with Constraints Under Different Contact Modes. Painleve'S Paradox and Dynamic Jamming, Impact Models, Zeno Phenomenon Dynamically Walking Robot Models, Stability of Orbits in Hybrid Systems, Poincare Maps. of:
1. Analysis of Planar Problems in Statics with Multiple Unilateral Frictional Contacts by Methods and by Solving Alinear Programming.
2. Formulating Equations of Motion for a Mechanical System with Contact Constraints.
3. Formulating Conditions for Occurrence of Painleve'S Paradox in a System with a Single Frictional Contact.4. Formulating Impact Laws for a Single Contact with and Without Friction in a System of Rigid Bodies.5.Formulating Equations of Motion of a Mecanical Systems with Intermittent Contacts as a Hybrid System. 6.Conducting Numerical Sinulations of Mecanical Systems with Intermittent Contact.
7. Finding Periodic Solutions of a Hybrid Dynamical System and Their Stability Using Poincare Map.

Contact Hours per Week

Lecture: 3 hours

Recitation: 2 hours

Credit points: 3

034039 Experimental Methods Laboratory

Temperature Measurement, Strain and Stress Measurements, Measurement of Force and Torque, Pressure Measurement, Velocity and Flow Rate Measurement, Displacement, Size, Force and Power Measurement.

Contact hours

Lab: 4 hours

Credit points: 1.5

034381 Research Project in Mechanical Eng. 2

The Final Research Project. (Supervised by Faculty Members Only) Definition of the Research Goal and Overview of the Different Methodologies to Tackle the Defined Research Goal. Description of the Experimental, Theoretical and Numerical Solutions or Combinations of Them, Oral Presentation and Written Report of Results and Conclusions.

Contact hours

Lab: 2 hours

Credit points: 3

035022 Finite Elements For Engineering Analysis

Principles of Finite Elements Methods (Including a Brief Review of Other Popular Numerical Methods) for the Solution of One- Dimensional Boundary Value Problems. Critical Evaluation of the Choice of the Physical Model and Its Mathematical Formulation (Dimension of the Problem, Material Behavior, and Boundary Conditions). Reliability of the Numerical Solution. Knowlegeable Use of Professional Codes for the Design of Mechanical Projects in Solid Mechanics and Heat Transfer.

Contact hours

Lecture: 2 hours

Recitation: 2 hours

Credit points: 3

036032 Analytical Flow Mechanics

034406 Advanced Control Lab

Demonstration of Principles Studied in the Courses "Control Theory" and "Industrial Automation."

Contact hours

Lab: 4 hours

Credit points: 2.5

036026 Kinematics Dynamics & Control of Robots

Forward and Inverse Kinematic Equations, Jacobian, Singularity, Lagrange Equations, Symbolic Simulation, Motion and State Equations. Perfect Global Linearization, Robustness, Linear Control, Min-Max and Adaptive Control, Tracking.

Contact hours

Lecture: 2 hours

Recitation: 1 hours

Credit points: 2.5

034041 Heat Transfer

Description:

The course is an introductory exposition to engineering heat transfer. It is part of the engineering curriculum of students in disciplines such as, mechanical, aerospace, chemical biomedical and material engineering. Concepts of control volume analysis, conservation laws of mass, momentum and energy, conduction, laminar and turbulent, convection and radiation will be developed and applied. The problems and examples will include theory and applications drawn from a wide range of engineering problems.

Prerequisites:

- Thermodynamics 1 (034035 or equivalent).
- Fluid Mechanics (034013 or equivalent)..

Course Objectives:

(1) Students will learn theory and applications of engineering heat transfer.
(2) Students will be expected to be able to formulate and solve problems of engineering heat transfer.

WEEK	COURSE TOPICS
1	Introductory Material, Modes of Heat Transfer, Control Volume Analysis, Conduction – Fourier's law
2	1D Steady State Conduction, Conduction with Thermal Energy Generation
3	Heat Transfer from Extended Surface, Fin Equation, Fin Performance
4	Solutions of 2D and 3D Steady State Conduction problems
5	Transient Conduction, Lumped Capacitance Method, Spatial Effects
6	Convection, Boundary layer, Laminar and Turbulent, Similarity, Reynolds Analogy
7	Convection, Flow over Flat Plate, Empirical Methods
8	Convection, External Flows, Flow over Cylinder, Sphere, Flow across banks of Tubes, Midterm Quiz
9	Convection in Internal Flows, Laminar Flow in Circular Tubes, Empirical Correlations
10	Natural (Free) Convection
11	Heat Exchangers
12	Radiation, Black Body, Absorption, Reflection, Transmission
13	Radiation Exchange Between Surfaces

Contact Hours per Week

Lecture: 3 hours

Recitation: 2 hours

Credit points: 4

034040 Introduction to Control

Course Objectives

- Comprehension of the notions of feedback control
- In depth analysis of stability, performance and robustness of control systems
- Synthesis of control laws in the frequency and time domains for fundamental engineering problems

Lecture Topics

1. Introduction, feedback and closed-loop
2. Modeling and control of DC motor
3. Deviation variables and linearization
4. Internal stability of closed loop
5. Steady state performance
6. Dynamic Performance
7. Industrial controllers
8. Root Locus –principles and design
9. Frequency response and Nyquist Criterion
10. Dead Times (Delays)
11. Signals and systems in frequency domain
12. Performance requirements in frequency domain
13. Stability margins
14. Design of leadlLag controllers
15. Realizations and tunings of PID controllers
16. Feedforward control
17. Finale: what you haven't studied in this course

Prerequisites

034032 – Linear Systems

Contact Hours per Week

Lecture: 2 Hours

Recitation: 2 Hour

Credit points: 3

034022 Introduction to Mechatronics

Description

This course provides an introduction to analysis and design principles of electronic circuits, with emphasis and examples from the emerging field of mechatronics. Topics include basic and semiconductor components, basic principles of electrical circuit analysis, circuit response to analog/digital excitation, analog system and circuits based on action amplifiers, digital electronics, gates (logic circuits) and circuits based on logic gates, memory components and circuits based on memory components, and microprocessors and microcontrollers.

Prerequisites

Courses in: Physics 2 (114075 or 114052), and Linear Systems (034032) or equivalent.

Course Topics

- Review of electrical components and circuit elements.
- Analysis of DC circuits.
- Transient response analysis.
- Frequency response analysis.
- Analog electronics (diode and transistor amplifiers).
- Digital electronics (logic gates, De Morgan's laws, and circuit systems).

Contact Hours per Week

Lecture: 2 hours.

Recitation: 1 Hour.

Credit points: 2.5

034371 Design for Manufacturing Project

Design of An Engineering Project, Based on Elements That Are Being Taught in "Engineering Design 1". Tutoring Will Be Enlarged on: Tolerancing, Materials, Processes and Fixtures. the Project Will Include: Concept Selection, Embodiment Design Including Analysis and Structure Optimization and Detailed Design in Computerized Drawings. the Design Will Include All the Required Data for Manufacturing.

Contact hours

Lecture: 1 hour

Credit points: 2.5

034051 Dynamics and Mechanics of Vibration

An important part of modern engineering is the analysis and prediction of the dynamical behavior of physical systems. An omnipresent type of dynamic behavior is vibratory motion in which the system

oscillates about a certain equilibrium position. This course on the theory of vibration is concerned with the oscillation of both rigid-body and continuous dynamical systems and includes derivation of their equations of motion (via both Newtonian and Lagrangian approaches), their solution (analytically and numerically) and analysis (frequency response, loss of stability and periodicity). Examples include those of classical mechanical systems (robotics, fluid-structure interaction, control) and current applications (micro- and nano- electromechanical systems). The objectives of this course include development and application of modern elements of vibration analysis for complex engineering systems.

Topics:

- classification of dynamical systems, Newtonian modeling, stability of equilibrium.
- orbital stability, periodicity, harmonic balance, Poincare' maps.
- Lagrangian modeling: energies, non-conservative generalized forces, holonomic constrains.
- free undamped vibrations, integrability, beats.
- free damped vibration, equivalent damping, backbone curves.
- flutter, self-excited vibration, friction induced vibration.
- forced harmonic vibration, primary and parametric resonances.
- multi-body vibrations, internal resosnances.
- continuous systems: string, rod, beam.
- free vibration of continuous systems: viscoelastic damping.
- forced vibration of continuous systems: Galerkins method, reduced order modeling.
- dynamic buckling and internal resonances.
- hybrid rigid-body and continuous systems, applications.

Literature:

Meirovitch, L., 1986, Elements of Vibration Analysis. (M 86).
Meirovitch, L., 1997, Principles and Techniques of Vibration. (M 97).
Selected scientific/technical papers and handouts (Matlab, Maple).
Additional references
* Review of Dynamics:
Greenwood, D.T., Principles of Dynamics, 1988.
O' Reilly, O.M., Engineering Dynamics: A Primer, 2000.
* The History of Vibration:
Rayleigh, J.W.S., The Theory of Sound, 1877 (Dover 1945).
Timoshenko, S., Vibration Problems in Engineering, 1928 (1959).
Den Hartog, J.P., Mechanical Vibrations, 1934 (Dover 1985).
* Advanced reading:
Moon, F.C., Chaotic and Fractal Dynamics, 1992.
Selected papers and handouts on 'analytical dynamics' and 'nonlinear vibration'.

Contact hours:

Lecture: 2 hours
Recitation: 1 hours
Credit points: 2.5

035001 Introduction to Robotics

Introduction, rigid body transformations; Rotation matrices and transformations, direct kinematics, inverse kinematics, Serial robot's Jacobian; Singular configurations; Static forces in serial robots; kinematic considerations in robot's design; trajectory planning in joint space and task space; Parallel robots; Dynamics of serial robots; Sensors for robotics.

Literature:

1. Lynch and Frank, "Modern Robotics," Cambridge, 2017 (pdf available).
2. Spong, "Robot Dynamics and Control", Wiley, 2005.
   Updated book: "Robot Modeling and Control", Wiley, 2006.
3. Tsai, "Robot Analysis - Mechanics of Serial and Parallel Manipulators", Wiley, 1999.

Contact hours

Lecture: 2 hours

Recitation: 1 hours

Credit points: 2.5

094481 Int. to Probability and Statistics

Description:

This course will present an introduction to the basic principles and vocabulary of probability and statistics. The first part of the course is an introduction to probability, including models commonly used in engineering. The second part of the course covers statistical methods for data analysis and the tools of statistical inference: drawing conclusions about a process or population from a sample.

Literature:

All the relevant material will be provided in the lectures and tutorials. Lecture slides and tutorial material are on the Moodle and should be downloaded by the students. Three supplementary books that include more than required are:

Freedman D., Pisani R. and Purves R. Statistics, Norton, New-York, 1998, 3rd edition.

Walpole R.E. and Myers R.H. Probability and Statistics for Engineers and Scientists, MacMillan, 1998.

Devore J.L. Probability and Statistics for Engineering and Sciences, 1991.

Course Objectives

- Probability model, conditional probability, Bayes' Law, independence.

- Discrete random variables: probability and distribution functions, mean and variance.
- Special discrete random variables: binomial, geometric, Poisson, hypergeometric, uniform.
- Joint random variables: bivariate distributions, covariance, independence.
- Continuous random variables: density and distribution functions, mean and variance.
- Special continuous random variables: exponential, uniform.
- Normal distribution and central limit theorem, including normal approximation of binomial distribution.
- Statistical inference, sampling distributions, point estimation - methods and properties.
- Point estimates and confidence intervals for mean, standard deviation and proportion.
- Hypothesis testing: type I and type II errors, significance, pvalue, power, meaning of "reject"/"don't reject", sensitivity to sample size.
- Comparing means and variances of two independent populations, comparing means for paired data.
- Tests for goodness of fit and for association.
- Simple linear regression: definition of model, R2, sums of squares, confidence curves

Course Expectations & Grading:

A homework assignment will be given each week. All homework must be submitted; it can be prepared in pairs. Each week one randomly selected question will be graded. The overall homework grades will be based on the best 10 of 12 weekly homework grades. The final examination will be open-book and open-note and will require a hand calculator (no laptops allowed). The examinations will cover only the material presented in the lectures and tutorials. The final grade will be calculated as follows:

20% homework grade

80% final examination grade

It is essential to keep up by doing the homework, as current concepts and methods taught will be based on previously taught material.

Contact hours:
Lecture: 3 hours
Recitation: 2 hours
Credit points: 4

034029 Solid Mechanics 2

Lecture Subjects

- Stresses
- Strains4
- Stress-Strain relations
- Failure criteria, pressure vessels
- Bending of beams, Moment of Inertia
- Shear stresses in beams
- Elastic deformation in bending

- Energy methods
- Column buckling

Books and studying material

1. Lecture copies
2. Extended Lecture notes
3. Questions from past exams
4. Popov E.P., 1978, "Mechanics of Materials", SI Version, Prentice Hall
5. Shames. H., "Mechanics of Deformable Solids", Prentice Hall
6. Parnes R, "Solid Mechanics in Engineering", J. Wiley & Sons, 2001
7. Course Video (in Hebrew)

e. Grades

Exercises – weekly without submission, based on problems given in previous exams. Final answers included.
Midterm Exam – 30 %, voluntary, can only improve grade, two hours long. Midterm is considered only if the grade of the final-exam is higher than 50.
Final Exam – 70%, three hours long. Two equivalent tests (term A and B), only the last exam-grade counts.

Contact Hours per Week

Lecture: 3 hours

Recitation: 2 hour

Credit points: 4

034033 Numerical Analysis

Course materials: 1. S.C. Chapra and R.P. Canale, Numerical Methods for Engineers, McGraw-Hill, 7th Edition (Textbook)
2. S.C. Chapra, *Applied Numerical Methods with MATLAB for Engineers and Scientists,* McGraw-Hill,3rd Edition (Reference book)
3. Lectures and tutorials notes.

General Course Description: This introductory course in numerical analysis introduces students to the basic methodology, and techniques for numerical solution of engineering problems. Topics covered include: roots of nonlinear equations, the solution of systems of linear algebraic equations (direct and iterative techniques), numerical interpolation, differentiation and integration methods, numerical solutions of ordinary differential equations (IVP and BVP).

Grading Plan:

Coursework will be weighted as follows:

Midterm Exam: 20%
Final Exam*: 65%
*The student **must pass** the final exam with a passing grade or higher; **otherwise,** the student fails the course
(Total grade=Final Exam grade).
Homework: 15%
No Late Homework / Assignment will be accepted.
Homework / Assignment must be neat and orderly so that your work can be followed clearly. Solutions which are not clearly written and easy to follow (based on the judgment of the instructor) will not be graded.

Statement on Academic Dishonesty
Academic dishonesty is an extremely serious offense and will not be tolerated in any form.
Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, but are not limited to, copying or plagiarizing class assignments including homework, reports, designs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the Technion's Academic Court for Students.
For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.

034035 Thermodynamics

Description

The course is designed as an introductory exposition to engineering thermodynamics. It is typically part of the engineering curriculum of students in disciplines such as mechanical, aerospace, chemical, biomedical and material engineering. It will meet weekly for 3 hours of lectures and 2 hours of recitations.

The course covers concepts including heat, work and energy. The first and second laws of thermodynamics are introduced for systems and control volumes. Engineering applications include power and refrigeration cycles. The course is augmented by a wide range of engineering problems and examples.

Prerequisites
104003 – Calculus 1 or equivalent.

Textbook
Required: A. Shavit and C. Gutfinger, "Thermodynamics – From Concepts to Applications",
2nd Edition, 649 pp., CRC Press, Division of Taylor & Francis, 2009.
http://isbndb.com/d/book/thermodynamics_a86.html

Course Objectives
- Students will learn theory and applications of engineering thermodynamics.
- Students will be expected to formulate and solve problems of engineering thermodynamics.

Course Topics

Chapter in book	**Course Topics**	Week
1, 2	Introduction, basic definitions, equilibrium	1
3	Work, First Law, energy, heat, Zeroth Law, temperature	2
4	State Principle, simple systems, pure substance, steam tables	3
5	Ideal gas	4
6	Control volume	5
7	Heat Engines, efficiency, reversibility, Thermodynamic temperature	6
8	Clausius Inequality, Entropy. **Midterm Quiz**: May 13, 2018	7
8	Entropy relations and diagrams,	8
9	Second Law applications	9
11	Steam work cycles – power stations	10
11	Gas work cycles – gas turbine	11
11	Refrigeration cycles – refrigerators and air conditioners	12
	Course summary and review.	13

Contact Hours per Week

Lecture: 3 Hours

Recitation: 2 Hour

Credit points: 4

104228 Partial differential equations

Lecture Topics

- General discussion of PDE and associated conditions
- first order equations
- the Cauchy problem and the method of characteristics
- existence and uniqueness theorem
- second order PDE – classification and canonical form

- well posedness
- one-dimensional wave equation
- D'Alembert method
- Sturm- Liouville problems and separation of variables
- heat and wave equations on different domains with Dirichlet and Neumann boundary conditions
- Laplace and Poisson equations
- the energy method
- the maximum principle and properties of harmonic functions

Homework:

Open HW exercises will be published every week - these are what we call “magen” grades, meaning they are not obligatory.

If you choose to submit the HW and your average HW grade is higher than your final exam grade, then it will be weighted as 20% of your final grade. In this case the grade will be calculated in the following way:

Final grade = 0.2*HW grade + 0.8*Exam grade

In case your average HW grade will be lower than your exam, your final grade will consist 100% of your exam grade.

Recommended books:

- Y. Pinchover & J. Rubinstein, An Introduction to Partial Differential Equations, Cambridge University Press, 2005.
- W.E. Boyce & R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems.
- E.C. Young, Partial Differential Equations, Allyn and Bacon.
- H.P. Weinberger, A First Course in Partial Differential Equations, Blaisdell, 1965.
- P.W. Berg & S.L. McGregor, Elementary Partial Differential Equations, Holden Day, 1966.
- A. Pinkus & S. Zafrany, Fourier Series and Integral Transforms, Cambridge University Press, 1997.

Contact Hours

Lecture: 2 hours

Recitation: 2 hour

Credit points: 3

034043 Computer Based Engineering Drawings

034042 Introduction to Engineering Drawing

Lecture Subjects:

1) Introduction to engineering drawing as the language of mechanical engineering.

2) To teach how to draw simple mechanical elements and to enable the engineer to sketch manually and with the help of instruments.

3) To enable the reading of mechanical drawings.

4) To provide a theoretical basis for computer-aided draughting.

The course covers selected, basic subjects of *descriptive geometry* and *engineering drawing*. The aim of descriptive geometry is the two-dimensional description of three-dimensional objects in a way that enables the recovery of form and dimensions. The engineering drawing inherits this aim and adds the requirement that the drawing shall enable the production of the drawn object with satisfying precision and in accordance with relevant standards and regulations. The engineering drawing is a language and, as each language, has a dictionary, a grammar and styles.
The dictionary and the grammar are defined by standards. The State of Israel has its own standards based on the international ISO standards. The style of drawing depends on personal experience and abilities.

Week	Lecture	Exercise
1	• About this course. • Drawing instruments. • How we see the world. • Central projection, parallel projection, orthographic projection. • Standard drawing formats and scales.	Geometrical constructions in plane. Monge's method, projections of 3D bodies on three projection planes.
2	Monge's projections on two planes. The point in four quadrants. –First angle view. Third angle view. This course uses the first-angle view. The projections of the straight line. Parallel lines, lines parallel to projection planes, intersecting lines. When is necessary a third projection. True length.	Points in space. Completing a 3rd projection based on two given projections. True length of line segment (TS).
3	Defining a plane. Special planes. Points and particular lines in the plane. Perpendicular on plane. The traces of a plane.	The common tangent of two circles. Relationships between point and plane. Perpendicular on plane. Constructing a line segment of given length.
4	The cube – projections, sections and development. Introduction to dimensioning	Relationships between lines and planes, and between planes. Cube development.
5	The pyramid – projections, sections, development. Dimensioning 2.	Development of pyramid.
6	Axonometric projection. The law of scales. Dimetric and trimetric projections. Recommendations for isometric projections.	Isometric views. Using a caliper for measurement. Basic dimensioning.

7	The cylinder – projections, sections, development. The influence of dimensioning on tolerances	Development of cylinder.
8	The helix – definitions, projections, equation, development, slope angle. **Midterm examination**	Resulting dimensions and alternative dimensions in linear chains.
9	The cone – projections, sections, development.	The development of the cone. Detail drawings, assemblies.
10	Screws, bolts and nuts. Tolerances of form.	Screws. Geometric tolerances 1: form and orientation.
11	Drawing gears. Surface roughness.	Geometric tolerances 2: positioning.
12	The sphere – projection, sections. Conclusion on developable surfaces.	Geometric tolerances 3: analysis in assemblies.
13	Assembly drawing – contents. Course conclusions, synthesis, comments on the continuation of learning.	Review.

The components of grades.
With midterm examination and if the midterm grade is higher than that of the final-exam grade: 60% exam + 10% midterm + 30% homework.
Without midterm examination, or if the midterm grade is lower than the final-exam grade: 70% exam + 30% homework.

Contact Hours per Week

Lecture: 2 hours

Recitation: 2 hour

Credit points: 3

104018 Differential and Integral Calculus 1M

Lecture Topics

1. Introduction
- notation and basic notions: sets of numbers
(natural, integers, real, rationales), intervals, absolute value, basic
rules of inequalities, triangle inequality, the function [x] (integer part of x).
|x|<M <===> -M < x < M.
- functions: domain, range, image, graph, onto (surjection),

one to one (injection), monotone function, bounded function.
- operations on functions including composition and inverse functions.
- notions of: definition, axiom, theorem, negation of statements, disproof, proof.

2. Limit of functions
- definition of a limit, punctured neighborhood, basic theorems, arithmetic of limits.
- one sided neighborhood, one sided limits, basic theorems.
- limit at infinity, infinite limits.
- sandwich theorem, "pizza" theorem
- trigonometric functions, lim sin x /x.
- bounded sets and functions, sup, inf, min, max, axiom of supremum, monotone bounded functions.

3. sequences
- definition of limit, basic theorems, arithmetic of limits.
- sandwich rule, q^n, n^{1/n}, a^{1/n}.
- monotone sequences, bounded sequences, recursively defined sequences.
- (1+1/n)^n monotone and bounded, e.
- subsequence, partial limits.
- Heine's theorem

4. continuous functions
- definitions
- arithmetic rules, composition, inverse functions.
- discontinuities.
- mean-value theorem
- Weierstrass theorem

5. the derivative
- definition + geometric meaning + in physics.
- derivatives of elementary functions
- one sided derivatives, differentiability ==> continuity
- arithmetic rules
- chain rule, log x, inverse function
- higher order derivatives

6. more on derivatives
- extremal points, Fermat's theorem
- theorems of Roll, Lagrange, Cauchy.
- derivatives of monotone functions
- min/max via the second derivative
- Lhopital's theorem
- convexity, inflexion point, drawing graphs of functions

7. Order of magnitude
- order of magnitude
- linear approximation
- taylor's polynomial

8. Integral
- indefinite integrals: integration by parts, substitution, partial fractions.

- definite integral, Riemann sum, geometric meaning, arithmetic rules.
- fundamental theorem + applications to definite integrals
- arc length, volume of rotational bodies (about the x-axis and y-axis)

9. generalized integrals

- integral of bounded function on a ray, integral of unbounded function on interval.
- comparison theorems
- absolute convergence

10. series

- definition through partial sums, geometric and telescopic series
- necessary conditions for convergence.
- comparison theorems
- root and ratio test
- integral test
- series with alternating signs. Leibniz theorem
- absolute convergence

11. power series

- definition, radius of convergence, domain of convergence,
- root and ratio method of finding the radius
- integration and derivation of power series
- Taylor series

Contact hours

Lecture: 4 hours

Recitation: 2 hours

Credit points: 5

104016 Algebra 1/Extended

Lecture Topics

1. Polynomials, Complex numbers and Fields.
2. Matrices: Terminology and special matrices, algebraic operations on matrices.
3. Systems of linear equations, Gaussian elimination, rank of a matrix.
4. Vector spaces and subspaces.
5. Linear combinations, linear span, linear dependence/independence.
6. Basis and dimension, including row and column spaces and coordinate vectors.
7. Invertible matrices, definition and properties.
8. Determinants, definitions and properties.
9. Linear transformations, kernel, image, dimension theorem, matrix with respect to a basis.
10. Matrix similarity and change of basis.
11. Eigenvalues and diagonalization.

Contact hours

Lecture: 4 hours

Recitation: 2 hours

Credit points: 5

234128 Introduction to Computer Programming - Python

324879 Issues in Contemporary Israeli Society

Introduction:

This course seeks to unravel the complexity of the Israeli political, social, and cultural aspects and provide tools for understanding the uniqueness of Israeli society and peoples. Students will read and discuss issues such as religion and democracy; ethnicity and nationalism; cultural diversity; gender, media and popular culture. The course introduces Israel's contemporary society through a holistic approach using lectures, films, and discussions.

Topic 1: Pre-State and early stages of nation building

Lesson 1 (13.7): Introduction to the course, Overview of Zionism, Modern history of Eretz Israel/Palestine

Lesson 2 (17.7): **T**he Holocaust and its impact on Israel

Topic 2: The Israeli-Palestinian conflict

Lesson 3 (20.7): The Arab-Palestinian minority in Israel

Lesson 4 (24.7): Military and society relations

Lesson 5 (27.7): Peace and Wars

Topic 3: Religion, ethnicity, and gender

Lesson 6 (31.7): Religious Secular Divide – part 1

Lesson 7 (3.8): Religious Secular Divide – part 2

Lesson 8 (7.8): Ethnicity divide

Lesson 9: Gender, gender and its relation to religion and ethnicity, Israel as a 'femilism' society

Lesson 10: Education in Israel- guest speaker

Lesson 11: Open space discussion

Lesson 12: Conclusions: Is there an Israeli culture?

Contact Hours per Week

Lecture: 2 Hours

Credit points: 2

324282 Politics of Identities: A Multicultural Perspective on Israeli Society

Introduction:

"Alcohol from Russia, Moroccan food, an Ashkenazi violin with a drop of Tinanai Nai ..." These words from one of the most popular songs in Israel today only partially express the complexity of Israeli society. Although it has been established as a Jewish state, demographic and cultural processes are reshaping the face of the Israeli society. Today, it is possible to speak of four "tribes": secular, national-religious, ultra-Orthodox and Arab living side by side. These demographic changes raise important issues regarding contemporary Israeli identity: What is Israeli culture? Is there room for a dominant Israeli culture? Is and how much space should be given to a wide variety of languages and cultures? In order to shed light on these issues, the course will deal with the various ways in which these issues are expressed in everyday life in Israel. The course will focus on three main topics: politics, family and education, and popular culture, with each subject being examined from four points of view of the various tribes.

Topic 1: Multi-culturalism in Israel

Lesson 1: Introduction to Israel's "new order" – part 1: Secular Jews, religious (dati'im) and ultra-orthodox (Haredi).

Lesson 2: Introduction to Israel's "new order" – part 2: Arab citizens of Israel: demographic characteristics, economy and education.

Topic 2: Politics in the Israeli context

Lesson 3: Israel's political institutions: The Knesset, the Government and the Party System.

Lesson 4: Between 'left' and 'right': Understanding the development and ideologies of Israel's two major political parties.

Lesson 5: Haredim (Ultra-Orthodox), Religious Zionists political parties and the Rabbinate.

Lesson 6: Arab Citizens of Israel: Everyday life and political representations.

Topic 3: Family, gender and education

Lessons 7: Femininity and masculinity in Israeli society: cross-cultural/religious perspective

Lesson 8: Motherhood as a national mission and children as a national asset

Lesson 9: Educational tracks in Israel: state-secular, state-religious, independent religious and Arab.

Topic 4: Popular culture

Lesson 11: Popular culture and the four tribes: poetry, literature and music

Lesson 12: Is there a main stream popular culture in Israel today?

Lesson 13: Final exam/presentations

Contact Hours per Week

Lecture: 2 Hours

Credit points: 2

324463 The Development of Nationalism in the Middle East

The objective of this course is to survey the power of religion and secular nationalism in the Middle East, their development and clash within different national entities and across state boundaries. In particular secular Arab nationalism and Islamic fundamentalism are locked in combat while the non-Arab Iranian (Persian) and Turkish identities have undergone intense Islamization in recent years. In Israel, Jewish nationalism (Zionism) suffers from the internal secular-religious clash and remains in a conflictual relationship with much of Arab/Islamic society.
Class attendance is mandatory.

Class 1: Early National/Religious Memories**:** Geographical survey and brief review of the ancient Levant with a special emphasis on ancient Israel and Judea, the ancestors of today's Jewish People. History and religion are integrated as "The National Memory" drawing on secular and sacred events making the ancient memories of yesteryear into the beacon of hope for a better tomorrow. Yesterday's events and cherished values form the basis for today's societies and conflicts.
We will survey ancient Jewish national understandings and touch on Christianity regarding its status as the national state religion in the Byzantine Empire. Both the clash with ancient Persia and Jewish community second class status will be discussed.

The Two Kingdoms of Israel –Jewish Virtual Library
www.jewishvirtuallibrary.org/jsource/History/Kingdoms1.html
The Byzantine Empire
www.**ancient**.eu/**Byzantine_Empire/**

Class 2: The Rise of Islam: The course of Middle Eastern history is determined by the appearance of the Prophet Mohammed and the advent of Islam. Over 1,000 years of successful Jihad bring the stamp of Arab and Muslim conquests from the Iberian Peninsula to India and beyond. Historical/religious "Defining Moments" will be emphasized and compared with those of the ancient Jewish World and the Byzantines.
Islam Origin, Islam History, Islam Beliefs
www.patheos.com/Library/**Islam**.html
Lewis, Bernard, *The Middle East*, Chapter 3 "Origins" pp. 51-74 (To be sent)

Class 3: The Rise and Fall of the Ottoman Empire: From the rise of the Ottoman Turks at the end of the 13th century to the height of power during the 16th and 17th centuries. Decline sets in with the European challenge by the late 1600s. The Jewish and Christian predicament under Islam and the rise of secular Arab nationalism as a non-Muslim (Christian) phenomena and its Enlightenment challenge to the traditional world. Ottoman European penetration will arrive at the gates of Vienna in 1683. Spurred on by the Enlightenment Europe moves on to the offensive and by the mid 19th century the Ottoman Empire is a shambles seeking direction and re-unification.
Ottoman Empire – read history through 1922
en.wikipedia.org/wiki/**Ottoman_Empire**

Class 4: Egypt throughout the Ages: We begin with an understanding of Egyptian nationalism from the period of the Pharaohs thru Coptic Christianity and the conquest of Islam. With its glorious ancient past and sense of national identity with the Nile as its center, the Egyptian power elite led the rise of secular nationalism beginning with Mahmet Ali and thru to the 20th century, setting the stage for the modern Egyptian State.
A Brief History of Egypt
www.localhistories.org/**egypt**mod.html

Class 5: Decline of the Ottoman Empire and Rise of Secular Arab Nationalism: The Arab World contained within the Ottoman Empire begins to stir during the 19th century. European cultural and political penetration commences with outreach to the Christian communities in the form of secular nationalist ideals. As the Ottoman Empire teetered on the edge of collapse the Tanzimat reforms were implemented. Islam as the unifying identity among the vast majority of Middle Eastern populations begins to falter as an emphasis on Arab identity begins to take hold. Given to European influence, secular Turkish loyalties aid in fraying the once unifying religious factor of Islam. In the aftermath of WWI the Arab World breaks off from the Ottomans, each going their separate way.
Nationalism in the Middle East, 1876–1945 - Oxford ...
www.oxfordhandbooks.com/view/10.../oxfordhb-9780199209194-e-1

Class 6: Iran – Clash between Shiism and Persian National Identity: The Iranian identity from ancient Zoroastrian Persia thru the advent of "Shiite" Islam centrism as of the 16th century combining religious and national loyalties. Persia fell well behind the other emerging Middle Eastern nation states until the rise of Reza Shah and the development of the 20th century Iranian identity.
Iran and Islam/the Iran Primer
iranprimer.usip.org/resource/**iran**-and-islam

Class 7 (Part I): Jewish National Liberation (Zionism): A review of Jewish Messianism and the salvific hope – religious failure vs. secular success. In the early modern period antisemitism and Enlightenment values of equality clash and the Jew hopes for acceptability in the emerging world. Jewish nationalism and a return to the ancient homeland are one of several solutions to "The Jewish Problem".
Israel Studies An Anthology: The History of Zionism
www.**jewishvirtuallibrary**.org/jsource/isdf/text/Maor.html

Development and Clash of Jewish and Palestinian Arab Nationalism (Part II): From the British Mandate to the Jewish State. Here there will be an investigation into the clash with Arab and specifically Palestinian nationalism through the Partition Plan and Israel's War of Independence and the failure of the Palestine national movement (1947- 49).
Israeli-Palestinian Conflict
en.wikipedia.org/wiki/**Israeli**–**Palestinian_conflict**

Class 8: The Rise of Nasserism in Egypt and the Baath in Syria/Iraq: Egypt's ancient geographic identity as a unifying factor thru the end of WWI. Islam made its comeback as evidenced by the backlash and establishment of the Muslim Brotherhood in Egypt in 1928 yet the secularists would reign.
In the 1950s and 60s there is the all important rise and hope of solidarity through "revolutionary" Arab nationalism – Nasserism (Egypt) and the Ba'ath (Syria and Iraq). The dream of pan-Arabism dominates. Comparisons will be made to find commonalities and conflicts between the two.
Egypt under Anwar Sadat make peace with Israel while Syria and Iraq do not.
The Death of Arab Secularism – The National
www.thenational.ae/arts-culture/the-death-of-arab-secularism

Hourani, Albert, *A History of the Arab Peoples,* Chapter 24, "The Climax of Arabism" and Chapter 25, "Arab Unity and Disunity" pp. 401- 433. (To be sent)
Requiem for Arab Nationalism (written in 2003)
www.meforum.org/518/requiem-for-**arab-nationalism**

Class 9: Turkey's Secular Revolution and Backlash : The Ottoman defeat in WWI and the rise of the Turkish secular nation state under Mustafa Kamal (Ataturk). Turkey turns West hoping to learn and integrate more with Europe and less with the Middle East. Islam as identity and religion in general are suppressed while Turkey vacillates between democracy and dictatorship. What appeared to be the beginnings of a "model" secular state to be in the Muslim World (1919-2003) was never completely secure in is identity.
The dominance of the "Islamist" Recep Tayyip Erdogan, his Justice and Development Party and the policies of "neo-Ottomanism) have dominated Turkey since the outset of the 21st century. Is Turkey destined to dominate the Middle East once again?
Turkey's Troubled Experiment with Secularism – by Mustafa Akyol
https://tcf.org/content/report/turkeys-troubled-experiment-secularism/?agreed=1

Class 10 (Part I): Israeli State Development and the Regeneration of the Palestine National Movement 1949-Present: Massive immigration, economic development and the institutionalization of the Israeli State ensue under Labor government guidance in particular under PMs David Ben Gurion and Levi Eshkol. Simultaneously the Palestine national movement reconstitutes itself under Yasir Arafat and the PLO. Israel and the PLO clash on numerous occasions.
Regionally Israel and the Arab world go to war in 1967 and again in 1973. The Jewish State reaches partial conflict resolution through peace agreements with Egypt (1979) and Jordan (1994). The Oslo Accords (1990s) prove less than successful with the Palestinians as relations mix conflict with acceptance.
Arab-Israeli Conflict
en.wikipedia.org/wiki/**Arab**–**Israeli_conflict**
History of the State of Israel – Israel Ministry of Foreign Affairs
www.mfa.gov.il/...**israel**/**history**/**HISTORY**-+The+**State**+of+**Israel**
Power of Religious Nationalism - Israel/the Palestinians (Part II): In attempts at conflict resolution with secular Palestinian nationalism the Oslo Accords (1990s) stutter and come up short. Gush Emunim, religious Zionism and the settlement movement dominate the ideological debate in Israel, denying the two-state solution while Islamic fundamentalism demanding Israel's destruction sweeps the Muslim world.
Can the hopes of the 1990s be realized? Israel withdrew from Gaza in 2005 but has battled Hamas in border wars from 2009-14. Can a weakened yet radicalized Palestinian Authority come to conflict resolution with an increasingly skeptical Israel in the wake of so much hostility from the Muslim World? Is the Trump "Deal of the Century" peace plan relevant when rejected by the Palestinians and most of the right/religious camp in Israel?
Ne'eman, Yisrael, *Hamas Jihad*, Chapter 5, "Hamas Ideological Victory, 2000-2016."
(To be sent)

Class 11: From Secularism to the Khomeini Revolution in Iran: Modern secular nationalism swept through Iran in the 20th century, succeeded with Reza Shah but failed with his son Mohammed Shah. The 1979 Khomeini Revolution proved the potency of radical Shiite Islam into the late 20th century and its continuing impact on the Middle East today.
What is the future of the Khomeinist Jihadi revolution? Iran continues to expand its nuclear program, build a powerful military despite Western sanctions and continue its proxy wars in Iraq, Syria,

Yemen and thru Hezbollah when confronting Israel, yet suffers from internal discontent and challenges from the Arab Gulf States.
Background and Causes of the Iranian Revolution – Wikipedia
https://en.wikipedia.org/wiki/Background_and_causes_of_the_Iranian_Revolution

Class 12: Middle East Balance Today: Today's Middle East pits three major forces against each other; Khomeinist Shiite Islam, the Sunni Muslim Brotherhood (including ISIS types), and the secular “moderate” Arab regimes as represented by Egypt, Jordan and the Gulf States. The extremist Shiites and Sunnis slaughter each other in Iraq and Syria as evidenced by the rise of the Islamic State (ISIS or ISIL) and even "secular" Turkey is led by the Islamist president Erdogan. Turmoil reigns through most of the region yet Israel is the focus of most media attention. Much to Western chagrin the 2011 "Arab Spring" is truly an "Islamic Awakening" while attempts to curb Iran’s nuclear development and conventional military power have proven ineffective.

The rise and fall of the Islamic State group: The long ... - BBC
https://www.bbc.com › news › world-middle-east-47210891
Iran vs. the Persian Gulf Arab States – What are the options should America continue its withdrawal from the Middle East?
Has secular nationalism failed in the Muslim and Arab world?
Overall – What are the chances for peace or at least some form of stability?

Class 13: Final Exam: – Twenty-five multiple choice questions based on approximately 60 names and terms handed out in class.

Additional Documents to be accessed from the Internet

Jewish State – Theordor Herzl
Balfour Declaration
Israel Declaration of Independence
Palestinian National Charter
Hamas Covenant
Oslo Accords – Declaration of Principles

324881 Topics in The History of Jewish People

096808 Selected Topics in Management: The Lean Startup

Course Objectives

This course is very different – it's not theoretical, it does not focus on writing papers or business plans, nor on patents creation. It's about creating actual startups and moving fast using the most up to date entrepreneurship methodology: The Lean Startup. The Lean Startup is focusing on finding early customers and users ("early adopters"), before investing a lot of money, time and efforts on building and marketing a solution. The concept avoids Business Plans as the first step in creating a new venture and prefers fast "validation" with customers over focusing on full product development, investors and pre-mature scale up. It uses a series of MVPs (Minimal Viable Products), which are targeted at getting feedback and learning from early adopters. The Lean Startup is being used widely not only in the "classic" startups' scene, but also in enterprises, non-profits, governmental agencies and other organizations which want to launch a new service or product under extreme uncertainty. The startup idea to be developed during the course can be anything you want. It doesn't have to be based on research. It can be a physical product, or a virtual service. It can be a for-profit business startup (preferably) or a non-profit one. And if you don't have an idea – that's fine, no worries. You will be able to join others, or find an initial idea at the beginning of the course, with the help of the lecturer and other students. One of the first steps in the course will be creating teams, to work on your startups. A team is made of two students that will work together to develop an startup idea.Each of the students having ideas will pitch the ideas very briefly in front of the class. Then we will form the teams. We'll learn the Lean Startup methodology and work accordingly on the ideas:

1. Define the most important assumptions of your startup, using tools focusing on customer understanding and on business model definition like The Lean Canvas.
2. Validate the riskiest assumptions, focusing on finding early adopters and validating their needs, problems, and the gap in the market.
3. Create a "low fidelity MVP" (Minimal Viable Product) to illustrate your solution for potential customers and users. It can be a landing page, a video clip, a power point demo presentation, some wireframes or a physical model of a hardware device.

4. Define you "high fidelity MVP", the actual product or service to start with, focusing on maximizing learning from users and customers.

Course Scope

The course will focus on:

- Familiarize the student with the Lean Startup concept and methodology
- Familiarize the student with The Lean Canvas and other customer focused tools for defining a startup model in an efficient yet detailed enough way. The course will deep dive into customer's problems and needs analysis.
- Familiarize the student with concept and some tools for developing MVPs (Minimal Viable Products).
- Provide the student with the tools needed to review alternative models for the startup and separate short term view from longer term vision.
- Provide the student with a tool needed to review progress level in a startup, based on the Lean Startup concept.
- Experiencing real-life situations where you work with other co-founders on your startup.
- Familiarize the student with the way to articulate a clear value proposition, which is an important ingredient to get customers.
- Improve presentation and pitching skills.

Teaching Methods

- The class will include a mix of lectures, workshops, working in teams and mentorship sessions.
- Learning by doing will be used as a primary teaching method. Students will gain hands-on experience through the initiation of a scalable venture.
- Students will have the opportunity to present their venture at the class and get feedback.

Course Content & Requirements:

Team assembly and Idea selection -

Students are asked to form a team of 2 members around a specific startup idea.

The idea must be for a scalable startup (not a small business), but is not limited in any other way.

The suggested ideas will be contributed by the students or, if needed, by the course lecturer.

Changing the idea within the course first sessions is permitted, as per the Lean Startup concept Pivots are part of the entrepreneurship cycle.

Course Assignments –

I. In-class Presentations:

The teams will be asked to prepare and present the following:

- An elevator pitch (no presentation is needed).
- A presentation focusing on the first elements of the Lean Canvas - Customers and Problems (or "gap in the market").
- A presentation on the next two Canvas elements, Solution (including MVP) and Value Proposition.
- A full canvas review.

The teams will be getting questions and feedback by the other teams' members and the course lecturer, in an open conversation. The presentations/pitch will be presented in class by the team members (each team member will be required to present part of the presentations).

II. Final Presentation:

The final team presentation will be held during the last session of the course. Every team member will actively participate the final presentation. The end of course presentation will be based on the on-going class presentations as prepared by each team, and include a full Lean Canvas model presentation, a detailed presentation of the MVP, the customer pitch and validation points.

Course Plan

Session 1.
Course introduction: objectives, processes & expectations.
The Lean Startup Intro lecture.
Short pitches, forming teams.

Session 2.
A lecture on Job-To-Be-Done and some Design Thinking tools for startups.
In-class exercises.
Start working on your own startup.

Session 3.
A lecture on the problem - gap in the market analysis, and on customers – personas and early adopters.
In-Class exercises.
Working on your startup, implementing the concepts learned.

Session 4.
A lecture on Business Models, Business Model Canvas and Lean Canvas.
Progress reports (All teams), focusing on customer and problem assumptions definitions.
In-Class exercises (long term and short-term canvases, competitor's canvas) and working on your startups.

Session 5.
A lecture on Validation.
Progress reports (All teams).
Mentoring and working on your startup.
Problem validation readiness (All teams)
Exercising problem validation with a campus related startup idea.

Session 6.
A lecture on Value Proposition.
Working to create your value proposition.
Creating a landing page for your startup.
Mentoring and working on your startup.

Session 7.
A lecture on MVPs, Solution Validation and Pivots
Mentoring and working on your startup.
Progress reports and presentations (All teams)

Session 8.
Pitching - the lean startup way.
Mentoring and working on your startup, focusing on defining and creating MVPs.
Continue with validation exercises.

Session 9.
A lecture on startup metrics and on Lean Startup in the enterprise.
A lecture on Decentralized Autonomous Organizations, "reinventing organizations" and entrepreneurship.

Working on creating the Final Presentation and preparation for the quiz.

Session 10.
Short Quiz.
Final Project presentations by all teams.

* Some adjustments may be possible.

Student Assessment

We expect eah student will attend all the class meetings and invest time either in team work during the entire period of the course.

The final grade will be based on the following elements*:

Final team presentation:	50%
Validation Progress within the course:	35%
Quiz:	15%

Recommended Readings:

Ries Eric, "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses", Crown Publishing, 2011.
Steve Blank, Bob Dorf, "The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company", K&S Ranch, 2012.

Contact hours

Lecture: 3 Hours

Credit points: 2.5