



COURSE INFORMATION				
<b>Course Code</b>	<b>MSN 501</b>	<b>Course Title</b>	<b>Methods in Scientific Research</b>	
<i>Semester</i>	<i>Credits</i>	<i>ECTS</i>	<i>C +P + L Hour</i>	<i>Prerequisites</i>
Fall/Spring	3	10	3+0+0	-

Language of Instruction	Course Level	Course Type
English	Graduate	Core
<b>Course Coordinator</b>	Asst. Prof. Dr. Nebahat ARAL	
<b>Instructors</b>	Asst. Prof. Dr. Nebahat ARAL	
<b>Assistants</b>	-	
<b>Goals</b>	The course objective is to explain the importance of scientific investigation and to illustrate the application of research techniques. The course is mainly intended to teach empirical approach, measurement process, and to certain extent, the use of statistical techniques for data analysis purposes.	
<b>Content</b>	This course basically covers the bases of scientific research, research planning, scientific methodology, research variables, hypothesis formulation, research design, data collection methods, data analysis techniques, and ethics in science.	
<b>Contribution of the Course to the Professional Education</b>	To gain the ability to use scientific methodology, principles of data analysis, statistical tools and to understand ethical values and to apply these skills.	

Course Learning Outcomes	Detailed Program Outcomes	Teaching Methods	Assessment Methods
Understanding the characteristics of science and research. Evaluating the methods that must be followed in order to conduct a scientific study over examples.	2a, 2b, 5a	1, 2, 6	A
Understanding the importance of literature review and learning the literature survey methods. Learning referencing and citation methods.	7c	1, 2, 6	A, F



Learning the methods for formulating the research question, forming the hypothesis, determining the variables and designing the experiment.	2a, 2b	1, 6	A, F
Learning the basic statistical methods for data analysis and solving applied examples for scientific studies.	5a	1, 5	A, F
Preparation of the research report according to the scientific methodology and presentation of the report. Ability to select the most suitable data visualization methods in report and presentation.	6c, 7b, 7c, 7d	1	A, F
Understanding the importance of ethics and unethical situations in science.	9a	1	A, F

<b>Teaching Methods:</b>	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 4: Use of simulations, 5: Problem solving assignment, 6: Reading assignment, 7: Laboratory work, 8: Term research paper, 9: Presentation by guest speaker, 10: Sample Project Review, 11: Interdisciplinary group working, 12: ...
<b>Assessment Methods:</b>	A: Written exam, B: Multiple-choice exam C: Take-home quiz, D: Experiment report, E: Homework, F: Project, G: Presentation by student, H: ...

**COURSE CONTENT**

<b>Week</b>	<b>Topics</b>	<b>Study Materials</b>
1	Course Overview	
2	Introduction to Science and Research: History, Principles, Characteristics	Textbook- Lecture Notes
3	Scientific Methods and Principles: Understanding the Methodology	Textbook- Lecture Notes
4	Introduction to Research Design and Research Questions	Textbook- Lecture Notes
5	Structure of a Scientific Study – Thesis and Articles	Textbook- Lecture Notes
6	Literature Survey Methods	Textbook- Lecture Notes
7	Midterm Exam I	Textbook- Lecture Notes
8	Fundamentals of Statistics in Scientific Research: Standard deviation, Variance, Confidence Intervals, Hypothesis Testing, Z-test, T-Test, P value	Textbook- Lecture Notes



9	Data Analyses by Statistical Methods	Textbook- Lecture Notes
10	Data Presentation and Discussion	Textbook- Lecture Notes
11	Midterm Exam II	Textbook- Lecture Notes
12	Term Project Presentations	Textbook- Lecture Notes
13	Term Project Presentations	Textbook- Lecture Notes
14	Ethics in Science	Textbook- Lecture Notes
15	Final	Textbook- Lecture Notes

#### RECOMMENDED SOURCES

<b>Textbook</b>	<p>Margaret Cargill and Patrick O'Connor, 2009, Writing Scientific Research Articles: Strategy and Steps, Wiley-Blackwell</p> <p>Ranjit Kumar, 2011, Research Methodology: a step-by-step guide for beginners, SAGE Publications</p>
<b>Additional Resources</b>	<p>Lutz Hering, Heike Hering, 2010, How to Write Technical Reports: Understandable Structure, Good Design, Convincing Presentation, Springer</p>

#### MATERIAL SHARING

<b>Documents</b>	
<b>Assignments</b>	
<b>Exams</b>	

#### ASSESSMENT

IN-TERM STUDIES	NUMBER	PERCENTAGE
Midterm Exam I	1	20
Midterm Exam II	1	20
Term Project	1	30



<b>Total</b>		<b>70</b>
<b>CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE</b>		30
<b>CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE</b>		70
<b>Total</b>		<b>100</b>

<b>COURSE CATEGORY</b>	Field Course
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<b>COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES</b>		
No	Program Learning Outcomes	check √
1a	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline,	
1b	Ability to use theoretical and applied knowledge in these areas in complex engineering problems.	
2a	Ability to identify, formulate, and solve complex engineering problems,	x
2b	Ability to select and apply proper analysis and modeling methods for this purpose.	x
3a	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result,	
3b	Ability to apply modern design methods for this purpose.	
4a	Ability to devise, select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice.	
4b	Ability to employ information technologies effectively.	
5a	Ability to design experiments for investigating complex engineering problems or discipline specific research questions,	x
5b	Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.	
6a	Ability to work efficiently in intra-disciplinary teams,	
6b	Ability to work efficiently in multi-disciplinary teams,	
6c	Ability to work individually.	x
7a	Ability to communicate effectively in Turkish, both orally and in writing,	
7b	Knowledge of a minimum of one foreign language,	x
7c	Ability to write effective reports and comprehend written reports, prepare design and production reports,	x
7d	Ability to make effective presentations,	x



7e	Ability to give and receive clear and intelligible instructions.	
8a	Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology,	
8b	Ability to continue to educate him/herself.	
9a	Consciousness to behave according to ethical principles and professional and ethical responsibility.	<b>x</b>
9b	Knowledge on standards used in engineering practice.	
10a	Knowledge about business life practices such as project management, risk management, change management.	
10b	Awareness in entrepreneurship and innovation.	
10c	Knowledge about sustainable development.	
11a	Knowledge about the global and social effects of engineering practices on health, environment, and safety,	
11b	Knowledge about contemporary issues of the century reflected into the field of engineering.	
11c	Awareness of the legal consequences of engineering solutions.	

<b>ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION</b>			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	10	140
Midterm Exams	2	15	30
Term Projects	1	20	20
Final	1	20	20
<b>Total Work Load</b>			252
<b>Total Work Load / 25 (h)</b>			10,08
<b>ECTS Credit of the Course</b>			10



Prepared by: Asst. Prof. Dr. Nebahat ARAL

Preparation date:  
15/12/2020