



NAZARBAYEV  
UNIVERSITY  
SCHOOL OF ENGINEERING  
AND DIGITAL SCIENCES

Dept. of Civil & Environmental  
Engineering



# Program Handbook

## Master of Engineering Management

Academic year 2019-2020 & onwards

# Welcome Note

Dear students,

On behalf of the Department of Civil & Environmental Engineering, it is my pleasure to welcome you to Nazarbayev University and the Master of Engineering Management (MEM) program. I wish you all, the greatest success and thank you for making NU your choice of postgraduate studies.

There are several reasons for students choosing to continue on to a postgraduate level of studies. Many do so for career advancement, while others do so for self-gratification. Whatever your reason, our diverse and experienced staff at Nazarbayev University will provide you with first-rate education and research knowledge. Just as you pride yourselves on the high quality of professional work that we know you are capable of, we pride ourselves on the continuing success and reputation of our programs.

The Master of Engineering Management program spans over 4 semesters (2 years) where you are required to complete 120 ECTS credits. You will be expected to successfully complete a number of courses offered by the School of Engineering and Digital Sciences (SEDS) and the Graduate School of Business (GSB). A targeted Capstone Project runs in the 4<sup>th</sup> semester of studies and you are expected to work on an applied subject in cooperation with an industrial partner; you will be asked to demonstrate your familiarity with the current literature in the field; analyze and evaluate results; support your findings in a scholarly manner according to disciplinary norms and finally, defend your work.

We understand that quality education with a balanced campus life is pivotal to students. In terms of quality education, programs at Nazarbayev University are all assured and monitored by a robust system. Our programs are all up to the trend and the knowledge and skills gained throughout the study can be readily applied in the workplace.

This handbook aims to provide you an overview of the Master of Engineering Management program and some services provided by the School of Engineering and Digital Sciences. Please spend some time on it and I am sure you will find some information which is important in the course of study.

Wishing you a successful endeavor in your Master of Engineering Management program!

Yours Sincerely,

Prof. Jong Kim

Head of Department (CEE)

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## Program Overview

The Master of Engineering Management (MEM) degree program is a specialized degree program offered by the School of Engineering and Digital Sciences (SEDS) in partnership with the Graduate School of Business (GSB) at Nazarbayev University (NU). Students are required to complete 120 ECTS credits, in 4 semesters, which satisfies requirements stipulated by the Bologna Process and the European Credit Transfer and Accumulation System (ECTS) for Master's degrees. The GSB courses are offered at the 2<sup>nd</sup> semester and are all block-based delivered as intensive three-weeks courses. SEDS courses, on the other hand, are offered at the other three semesters and are all semester-long, fourteen weeks courses. The aim of the program is to prepare students with the technical skills and business knowledge for leadership of engineering-related units of enterprises with innovative solutions for complex business problems.

Finally, it is the mission of the School to train the future scholars of Kazakhstan. By delivering the Master of Engineering Management program at an international standard level, we are offering our master's students new opportunities in terms of PhD and positions in research centers, locally or abroad.

## Aims and Objectives

The mission of the School of Engineering and Digital Sciences and of the Graduate School of Business of Nazarbayev University is to contribute to the development of Kazakhstan in terms of:

- Educating students with engineering and management expertise to lead organizations and provide innovative solutions for complex technical and business issues of enterprises.
- Conducting innovative and pioneering basic and applied research that evolve the body of knowledge in Engineering Management through interdisciplinary collaboration with other schools and research centers in Nazarbayev University and leading universities worldwide.
- Advancing the professional development in engineering and management through our service to the professional community and providing lifelong learning opportunities for practitioners.

The MEM program aims to reflect the mission of the School of Engineering and Digital Sciences and of the Graduate School of Business, and accomplishes this by pursuing the following objectives:

- Provide postgraduate engineers with the current tools, knowledge and skills necessary for a successful career in local and global engineering management.
- Support the progression of engineers of all disciplines to management roles in both private and public sectors.
- Develop future leaders of technology-based organizations by providing a **state of the art and applied** engineering management curriculum to a select group of high potential students with science and engineering backgrounds.
- Promote the importance of entrepreneurship, intrapreneurship and the core values of ethical enterprise in modern economies

## Graduate Attributes

The MEM program immerses the student within a scientific and technological ecosystem to favor their professional growth according to NU Graduate Attributes, which are very well aligned with the vision and mission of NU. The NU Graduate Attributes are:

- GA1.** Possess an in-depth and sophisticated understanding of their domain of study.
- GA2.** Be intellectually agile, curious, creative and open-minded.
- GA3.** Be thoughtful decision makers who know how to involve others.
- GA4.** Be entrepreneurial, self-propelling and able to create new opportunities.
- GA5.** Be fluent and nuanced communicators across languages and cultures
- GA6.** Be cultured and tolerant citizens of the world.
- GA7.** Demonstrate high personal integrity and
- GA8.** Be prepared to take a leading role in the development of their country.

The MEM program delivers these attributes by providing the students opportunities to be involved in individual and group work, team building exercises for developing decision making skills, engaged with design tasks for developing creativity, presenting project reports to polish their communication skills and through group discussions among group members and faculty, develop personal integrity and cultural tolerance. These attributes are addressed by the learning outcomes that follow.

## Program Learning Outcomes

On successful completion of the program the MEM graduates will be able to:

- L01.** Identify, formulate, and solve engineering management problems (in local firms) by using techniques, skills and modern engineering tools.
- L02.** Design and conduct experiments related to operations, marketing, management and finance, as well as to analyze and interpret data.
- L03.** Design an operational system and its various components and processes for engineering management applications.
- L04.** Enhance professional ethical responsibility and communicate effectively individually and in teams.
- L05.** Integrate engineering and enterprise solutions in a global and societal context.
- L06.** Promote the importance of entrepreneurship and intrapreneurship and exhibit high degree of leadership.
- L07.** Do research by applying 'Analysis' and 'Synthesis' techniques.

These Program Learning Outcomes (LO) can be mapped to the NU Graduate Attributes (GA) as follows:

		Program Learning Outcomes						
		L01	L02	L03	L04	L05	L06	L07
NU Graduate Attributes	GA1	☑	☑	☑		☑		☑
	GA2		☑		☑	☑		
	GA3	☑	☑	☑	☑		☑	
	GA4		☑	☑		☑		☑
	GA5				☑		☑	
	GA6				☑	☑	☑	
	GA7						☑	
	GA8					X		

## Program Duration

The nominal MSc program duration is **two years**, while the maximum allowable duration can be extended up to **two and half years** (excluding leave of absence and deferment of admission; see “*ACADEMIC POLICIES AND PROCEDURES FOR GRADUATE PROGRAMS OF THE AUTONOMOUS ORGANIZATION OF EDUCATION ‘NAZARBAYEV UNIVERSITY’*” for further details).

## Assessment

Assessment is aligned with the learning outcomes of the program and of those of each course. Course assessment tasks are performed during and at the end of each course. Types of assessment vary from successful completion of integrated coursework, assignments, and project work to evaluation of performance of case studies, interviews, and deliverance of presentations.

The following table summarizes assessment and evaluation points for all stages of the MEM program:

<i>Stage of Program</i>	<i>Significance</i>	<i>Possible Results</i>	<i>Evaluation Point</i>
ADMISSION TO PROGRAM	Initial Evaluation	Admission	<b>Key Evaluation Point</b> Admission is handled on a case-by-case basis by evaluating the student’s undergraduate curriculum, English proficiency and letters of recommendation among other documents and interview (only for shortlisted candidates)
		Admission with Conditional Status, Subject to Satisfactory Completion of Conditions	
		Rejection	
COURSEWORK	Determination of Student Competence in Fundamentals of Discipline	Continue in Program	<b>Continuous Evaluation</b> The coursework component for the Master of Engineering Management is assessed by the module instructor. It is enforced that all faculties provide a module descriptor to students at the start of the course outlining the weight of each assessment.
		Continue on Probation	
		Severed from Program	
DEGREE CANDIDACY	Demonstration of Student’s Mastery of Content Knowledge and Skills in the Discipline	Pass and Continue in Program	<b>Key Evaluation Point</b>
		Required to Re-Take Some Courses	
		Severed from Program	
COMPLETION OF CAPSTONE PROJECT	Demonstration of Student’s Mastery of Content Knowledge and Skills Needed to Graduate	Pass	<b>Key Evaluation Point</b>
		Recommend Changes with or without re-defense	
		Fail and dismissal from Program	

# MASTER OF SCIENCE - PROGRAM

## Course-type key

Engineering Core courses

Discipline core courses

Free/Discipline electives

## SEMESTER 1 FALL: 2019 August 06 – December 14

TYPE	COURSE CODE & TITLE	ECTS
Core	MSC 615 - ADVANCED STATISTICS & PROBABILITY	6
	MSC 616 - RESEARCH METHODS AND ETHICS	6
	EMEM 533 - ENGINEERING MANAGEMENT & ENGINEERING ECONOMY	6
	EMEM 507 - PROJECT MANAGEMENT	6
Elective	SEDS ELECTIVE COURSE	6

## SEMESTER 2 SPRING: 2020 January 13 – May 18

TYPE	COURSE CODE & TITLE	ECTS
Core	<b>Block 1:</b> EMEM 510 Accounting	4
	EMEM 511 Business Strategy	4
	<b>Block 2:</b> EMEM 517 Marketing	4
	EMEM 545 Business Communication	4
	<b>Block 3:</b> EMEM 513 Entrepreneurship	4
	EMEM 514 Finance	4
	<b>Block 4:</b> EMEM 516 Management of Organizations	4
	EMEM 548 Understanding & Predicting Consumer Behavior	4

## SEMESTER 3 FALL: 2020 August 17 – December 11

TYPE	COURSE CODE & TITLE	ECTS
Core	EMEM 542 – PRODUCTION AND SERVICE OPERATIONS MANAGEMENT	6
	EMEM 537 – ENGINEERING DECISION TOOLS	6
	EMEM 523 – SUPPLY CHAIN MANAGEMENT	6
Elective	SEDS ELECTIVE COURSE	6
Elective	SEDS ELECTIVE COURSE	6

## SEMESTER 4 SPRING: 2021 January 18 – May 18

TYPE	COURSE CODE & TITLE	ECTS
Core	EMEM 535 – MANAGING PRODUCT & SERVICE DEVELOPMENT	6
Elective	SEDS ELECTIVE COURSE	6
	EMEM 529 – CAPSTONE PROJECT	16

### *List of SEDS Elective Courses*

<i>EMEM 509 Systems Engineering</i>	6 ECTS	SEDS
<i>EMEM 527 Globalization and Engineering</i>	6 ECTS	SEDS
<i>EMEM 538 Knowledge and Innovation Management</i>	6 ECTS	SEDS
<i>EMEM 539 Big Data and Information Management</i>	6 ECTS	SEDS
<i>EMEM 541 Operations Research Methods</i>	6 ECTS	SEDS
<i>EMEM 543 Quality and Lean Management</i>	6 ECTS	SEDS

## Academic Policies and Procedures

All academic policies and procedures that are not explicitly covered in this handbook are conformant with the corresponding items described in “*SCHOOL OF ENGINEERING AND DIGITAL SCIENCES MASTERS STUDENT HANDBOOK*”, which covers School of Engineering and Digital Sciences Master Programs, and the “*ACADEMIC POLICIES AND PROCEDURES FOR GRADUATE PROGRAMS OF THE AUTONOMOUS ORGANIZATION OF EDUCATION “NAZARBAYEV UNIVERSITY” (APP-Graduate Programs-NU)*”, which covers all graduate programs in Nazarbayev University. These policies and procedures include, among others, the following:

1. Admissions
2. Registration
3. Credits (Requirements, awarding & transfers)
4. Grading issues such as: administrative grades, grade appeals
5. Course re-takes
6. Degree withdrawals
7. Academic code of behavior
8. Leaves of absence, including medical reasons, immediate family member issues and others
9. Dismissal & voluntary withdrawal.

Every student participating in the MEM program is expected to have read and understood all the policies, rules, procedures, and guidelines described in this program specific handbook, school’s MSc handbook and the general APP for graduate programs in NU.

# Grading System

## Graded courses

Letter Grade	Grade Points	Percentage
A	4.00	95-100%
A-	3.67	90-94.9%
B+	3.33	85-89.9%
B	3.00	80-84.9%
B-	2.67	75-79.9%
C+	2.33	70-74.9%
C	2.00	65-69.9%
C-	1.67	60-64.9%
D+	1.33	55-59.9%
D	1.00	50-54.9%
F	0.00	0-49.9%

## Non-graded (PASS/FAIL) courses

In the case of a non-graded course, the following assessment percentages apply

Description	Percentage
Pass	59% or Above
Fail	Below 59%

## Program Completion Requirements

Satisfactory completion of the MSc program requires that the student progress through a number of distinct stages, each of which is characterized by a key evaluation point (See Appendix). The necessary stages are:

- 1) Satisfactory application to the program.
- 2) Completing all required coursework in the program (104 ECTS).
- 3) Satisfactory completion of the Capstone Project(16 ECTS).
- 4) Satisfactory achievement of minimum GPA for continuation through semesters and graduation (Candidacy).

## Continuation / normal progress

To continue in the MEM graduate program at SEDS, NU, a student must maintain a minimum CGPA of no less than a **B- (2.67 on a 4-point scale)** after each grading period and conform to all program rules and policies to maintain normal progress toward degree. A student who fails to satisfy the continuation requirement for the program is subject to dismissal.

## Appealing against grades

If a student believes that she or he has received an unfair or erroneous grade, the student may appeal. The following are cases for appeal:

- 1) **In the case of an examination.** The student must first consult with the instructor within 5 working days of her or his receipt of the contested grade (this time may be extended in the event that the instructor can be shown to have been unavailable during the period following the student's receipt of the grade in question). The Instructor must respond within the next 5 working days. In the event that the student is still dissatisfied, she or he may appeal to the Dean of the School (or the Dean's designee) within 5 working days. The Dean (or her or his designee) shall consult with the Instructor before making any decision. The decision of the Dean (or her or his designee) shall be final.
- 2) **In the case of a Final Course Grade.** The student must first consult with the instructor within 5 working days of her or his receipt of the contested grade (this time may be extended in the event that the instructor can be shown to have been unavailable during the period following the student's receipt of the grade in question). The date to be used for appeals of Final Course Grades is the date published in the Academic Calendar. The Instructor must respond within the next 5 working days (that time may be extended in the event the instructor is shown to have been unavailable during the period following the student's receipt of their final grade). In the event that the student still believes that the grade is incorrect, or the Instructor has not replied within 15 days, the student may appeal to the Dean of the School (or the Dean's designee) within 5 days. The Dean (or her or his designee) shall consult with the Instructor before making any decision. The decision of the Dean (or her or his designee) shall be final.

## Plagiarism

In any coursework or thesis assessment, unacknowledged copying or plagiarism is not acceptable. Plagiarism can result in extremely serious academic actions including cancellation of any or all results, suspension from the program, or even expulsion. Plagiarism means using the work of others in preparing an assignment and presenting it as your own without explicitly acknowledging – or referencing – where it came from. Plagiarism can also mean not acknowledging the full extent of indebtedness to a source. Work can be plagiarized from many sources including books, articles, the internet, and other media. Plagiarism can also occur unconsciously or inadvertently. Direct copying is definitely plagiarism. Paraphrasing of another's work without acknowledgment is also plagiarism. Submitting someone else's work or ideas without attribution is not evidence of your own grasp of the material and cannot earn you marks.

Nazarbayev University's policy on plagiarism sets out student responsibilities in regard to copying. Students are responsible for ensuring that:

- They are familiar with the expected conventions of authorship and the appropriate use and acknowledgement of all forms of intellectual material relevant to their discipline.
- The work submitted for assessment is their own.
- They take all reasonable steps to ensure their work cannot be accessed by others who might seek to submit it, in whole or in part, as their own.

Whenever you refer to another person's research or ideas -either by directly quoting or by paraphrasing them-, you must acknowledge your source by proper referencing. Turnitin is a useful web-based originality checking service that can help in assessing the originality of one's submitted work. More information on Turnitin can be found in Appendix I and service's web site (<http://turnitin.com/>).

# Description of Courses

## Course-type key

Engineering Core courses

Discipline core courses

Free/Discipline electives

## 1<sup>st</sup> Semester

### MSC 615: Advanced Statistics and Probability

Quantitative analysis of uncertainty and risk for engineering applications. Review of some fundamental concepts of probability and probability distributions (discrete, continuous, joint). Descriptive statistics, estimation of distribution parameters (method of moments, method of maximum likelihood), statistical intervals, and hypothesis testing.

### MSC 616: Research Methods & Ethics

This course addresses the primary need for graduate students to undertake formal training that will help them in understanding how to conduct their research. The course will develop students' understanding of research planning and engender skills enhancement for reading, interpreting, writing about and presenting key ideas. The course will also instill an understanding of a variety of research methods and ethics, as well as implementation of appropriate strategies in lecture and workshop settings.

### EMEM 533: Engineering Management and Engineering Economy

Engineering Management is the integration of human relations, planning and control concepts, systems analysis and design, and principles of management oriented toward engineering functions within an organization; organizational design and administration as they impact along the product life cycle, i.e., research, design, development, production and use.

Engineering Economy is concerned with fundamental concepts and advanced techniques of engineering economic analysis; evaluation of alternative capital investments considering income taxes, depreciation and inflation; discounted cash flow analysis of competing projects, break-even analysis and determination of rate of return on investment, Risk and uncertainty in engineering analysis. This course will help students to explore strategies, models, and practices for leading and managing engineering organizations in a context directly relevant to them. They will engage in self-reflection about their styles, beliefs, and past experiences with leadership and management, and emerge with an insightful understanding of their personal approach as a professional. Besides, students will learn to improve their grasp of the "big picture" and how daily decisions affect the financial performance of an organization. They will learn principles and practices of interpreting financial information and performing engineering-related economic analyses. This course focuses on current practices, using economic information for decision-making and control. Students will practice applying these techniques to applications in real firms.

### EMEM 507: Project Management

The course deals with the study and practice of Project Management from project inception to completion. Initially, the knowledge areas, methodologies and approaches for project evaluation and selection among candidate projects are presented, and the necessity to align the project management objectives with the strategy of an organization are highlighted. Then, a step-by-step presentation of the Project

Management knowledge areas is performed, starting from Integration Management and passing through Stakeholder Management, Scope Management, Schedule Management, Cost Management, Communications Management and Risk Management, accompanied by elements of Change Management and Earned Value Management. A thorough presentation and analysis of most globally accepted and universally adopted tools, methodologies and techniques is performed, accompanied by the examination of a business case where all such tools are applied. Students work in groups to analyze the business case, to develop appropriate documentation and reports, and to present their results in class, in a strongly interactive context. In parallel, students spend significant time learning and practicing with MS Project 2016, where project modeling, planning, scheduling, optimization, budgeting, resource allocation, baselining, tracking and reporting aspects are examined and practiced for a project that is progressively developed. The acquaintance with this software enables students to profit of their knowledge in the job market and encourages them to pursue relevant certification(s). The entirety of the course strengthens the link between theory and practice and prepares students for employment in local and/or international projects.

## **2<sup>nd</sup> Semester**

### **EMEM 510: Accounting**

The course covers the fundamental principles of financial and managerial accounting. The principal objective of the course is to develop your ability to read, understand, and use corporate accounting information. To achieve this objective, the course introduces the basics of financial reporting (including both the U.S. and international standards) to information users outside of the firm—as well as selected topics on the internal (i.e., managerial) uses of accounting information. Because the course takes the perspective of a user of the accounting information, it focuses on the concepts relevant to decision makers—such as managers, current and prospective investors, creditors, customers, suppliers, and regulators.

In order to understand how accounting reports reflect the underlying economics of the firm and to use them in making forecasts, you should know the basics of record keeping, have a good grasp of the effects of typical business transactions on the accounting statements, and understand the implications of generic business strategies (e.g., product differentiation) for the firm's financial reports. We will also study the financial reporting environment, the role of the standard-setting bodies and other key players, and the desirable properties of accounting information (e.g., relevance and reliability).

The course focuses on how economic events and transactions are reflected in the firm's accounting system as financial and non-financial information, how this information is processed and communicated to the users. To be informed users, you should understand the nature of the decisions at hand; accordingly, the course will draw on the insights from microeconomics, decision analysis, operations management, and finance.

### **EMEM 511: Business Strategy**

This course deals with the work and understanding of strategic management. The course adopts the perspective of managers within the corporation, business, division, plant, or other operating unit who must align their individual actions and responsibilities with the overall objectives of the firm. During the course, students will focus on the perspectives and skills required to diagnose and find realistic solutions for critical problems in complex business situations. The course deals with issues of both managerial effectiveness and business efficiency-emphasizing "doing the right things" as well as "doing things right," while avoiding falling into the trap of doing the wrong things really well. This course will

teach strategic skills and techniques that can be used to analyze any situation in any environment. Students will learn how to analyze a case end-to-end and recommend an appropriate course of action.

## EMEM 512: Leading Change

The primary objective of this course is to acquire knowledge and gain an understanding of the basic principles associated with effectively leading change initiatives in organizations. Students will be introduced to the theories, concepts and practices of managing change, whether planned, incremental and localized, or revolutionary, under conditions of stability or crisis, and system wide. In effect, change theories and contemporary practices will be examined at the individual, group/departmental and organizational levels. Beyond studying the causes and consequences of change, and the advantages/disadvantages of leading change from the top as opposed to bottom-up change, we will also investigate potential sources of resistance to change and strategies for overcoming them.

A second objective is to contribute to the development of the professional and clinical skills of students as change agents through intensive study and case analyses. The perspective taken is that of the responsible leader and the role he or she can and should play with respect to understanding and managing context, content, and process. More specifically, through intensive case analyses, we will study where and under what conditions the need for change is called for (context), what form or type of change is required (content), how change can be successfully implemented or managed (process), and competencies development or key success factors for those leading or managing change program or initiatives in organizations.

## EMEM 513: Entrepreneurship

The focus of this course is the successful creation and early execution of a new venture. The course concentrates on new enterprises based on substantial innovations with potential for high growth and funding by venture capitalists. The course covers the topics of industry entry, new firm formation, the advantages and disadvantages of small firm size for technological competition, achieving and sustaining competitive advantage within industries, and patterns of technology and industry evolution and associated windows of opportunity for entry. In the first part of the course, students will concentrate on opportunity evaluation and business plan development. Then, in the second part of the course students will explore the strategic challenges of managing growth and realizing value. The psychology of entrepreneurs and how that might affect the quality of their decisions will also be considered.

## EMEM 514: Finance

This course examines important issues in corporate finance from the perspective of financial managers who are responsible for making significant investment and financing decisions. The course covers both financial tools and applications. The first part of the course will focus on mastering the tools that lay beneath all modern financial decision making. Broadly speaking, this involves discounted cash flow analysis that appropriately takes into account taxes, as well as equilibrium risk and return tradeoffs faced by participants in capital markets. The second half of the course explores contemporary issues that will be of importance to anyone seeking a job in the financial markets industry. A wide range of topics will be covered, such as venture capital, private equity, mergers and acquisitions, initial public offerings, and financial distress.

While the course is not designed to dwell on abstraction, the basic theoretical underpinnings of the various topics are a prerequisite to competent analysis. An emphasis is placed on the development of problem-solving skills based on a good understanding of the business environment as opposed to pure

theorizing or mindless numbers exercises. Because of the practical importance of the material and as an illustration of the relevant theory, students will discuss examples and cases.

## EMEM 516: Management of Organizations

The purpose of this course is to prepare the student to be an effective leader and manager of others regardless of career path, and to be a good analyst of how best to organize people. The course will focus on two broad sets of questions. First, what principles can one draw on to analyze and improve performance in organizations? How can a manager exert influence for positive results at any level of an organization? How can the manager maintain high ethical standards? Students will examine principles for designing incentive systems, motivating employees, running effective teams, making good decisions, harnessing diversity, and organizing the distribution of work. The second set of questions concerns what an individual needs to do to be an effective leader. What can the graduate contribute to his/her firm and why should others respect and listen to him/her? Students will be challenged to reflect on their own personal strengths and weaknesses and to develop specific strategies for making a difference in any organization.

## EMEM 517: Marketing

The course will provide you with a systematic framework for understanding marketing management and practice. The classes will combine the theoretical and practical part following an open discussion format. The course puts emphasis on how to (1) assess marketing opportunities by analyzing customers, competitors, and their own company (the 3 C's), and (2) design effective marketing programs via selecting appropriate strategies for pricing, promotion, place, and product (the 4 P's). Accordingly, this course is organized around these three C's and four P's. While most course sessions emphasize one of these topics, please note that the goal of this course is to prepare you to create a marketing strategy that concurrently addresses all of these points.

## EMEM 545: Business Communication

This course presents competent communication as a critical component for personal career and organizational success. We will work to understand the foundation of competent communication in the business world as well as to assess and improve our own verbal and written communication to be more effective, clear, appropriately assertive and based in foundations of personal integrity and leadership. Students will practice developing and delivering presentations, using appropriate and effective visual support, which will demonstrate relevance and benefits to audiences at varying levels or expertise and interest. Students will also practice drafting and editing succinct, clear, readable written business documents which create effective and memorable messages.

## EMEM 548: Understanding and Predicting Consumer Behavior

Consumer behavior is omnipresent; we cannot escape it – every moment of our lives we engage in some form of consumer behavior. It examines the impact of external environmental influences (culture, subculture, social class, reference groups, family, and personal influences) and internal psychological influences (personality, lifestyle, learning, motivation, perception, and self-concept) on consumer decision-making process. It explores stimuli that informs, persuades, and influences our choices, purchase decisions, dreams and aspirations.

Consumer behavior is always changing – just think of how consumers spent their time online 5 years ago, compared to their habits today. It is important for companies to understand why and how consumers change their behavior, how these changes affect their perceptions and attitude towards buying and

brands. The first step of understanding the change can lead towards predicting the behavior. once you can predict you can control.

The study of consumer behavior uses concepts, theories, and principles from the social sciences to extend our understanding of factors influencing the acquisition, consumption, and disposition of goods, services, and ideas. You will learn how and why consumers behave by examining how we use products to define ourselves and how this self-concept affects our attention and perception, our motivation to buy, our memory for brands, product and advertising awareness, our brand attitudes, product judgment and choice, customer satisfaction and brand loyalty.

### **3<sup>rd</sup> Semester**

#### **EMEM 542: Production and Service Operations Management**

This course explores issues related to planning and controlling the processes used to produce the goods and services provided by an organization. Managing these complex processes including resources such as human, materials, inventories, and facilities can be quite challenging. The course will introduce students to the functional area of operations and will increase their knowledge of how a firm's operations interface with the other functional areas of the organization, familiarize students with the various issues and problems that traditionally arise in the management of operations within both manufacturing and service organizations, and acquaint students with some of the methodologies in the handling and resolution of operations issues and problems. The contents of the course include both Production Management and Service Management.

#### **EMEM 537: Engineering Decision Tools**

Optimization is the problem of making decisions to maximize or minimize an objective in the presence of complicating constraints. This course will cover theories, methods, and applications of linear programming, integer programming, nonlinear programming, network models, decision analysis and games. Students will learn optimization methods and their applications to problems in engineering and business. Optimization can bring efficiency throughout the organization and may be used in the design and analysis of engineered systems of all kinds. The course emphasizes on modeling, the process of taking a real-world problem and transforming it into a formulation that can then be solved by the optimization methods. Throughout the course, Microsoft Excel will be used as a modeling environment, using add-in programs as necessary. Familiarity with Excel is an important prerequisite for this course.

#### **EMEM 523: Supply Chain Management**

The goal of this course is to cover both the high-level supply chain strategy and concepts (the strategic role of a supply chain and the key strategic drivers of supply chain performance: facilities, inventory, transportation, information, sourcing and pricing) and to give students a solid understanding of the analytical tools necessary to solve supply chain problems. Particular attention is being paid to the managerial context in which the methodologies are used and the managerial levers for supply chain improvement. Special emphasis will be paid to the analysis of case studies of well-known international firms for the students to apply successful supply chains in local firms to improve their performance.

## 4<sup>th</sup> Semester

### **EMEM 535: Managing Product and Service Development**

How do companies ensure innovative ideas are transformed into a product or service? Irrespective of their size, location, number of employees, revenue margin, or industry segment, all companies transform their innovative strategies into real world products/services. Some companies have well defined transformation steps that they call product/service development process; others simply just do whatever it takes without organized planning. But in general, they all go through major iterative phases such as: discovery, definition, development, demonstration, qualification, deployment, and life cycle management. Furthermore, there are factors that impact all these phases such as: source of funding, people relations, supply chain, design/development tools, time constraints, internal/external regulations, etc. Adequate management of these factors enables the development process to be executed on time and on budget in order to meet customer needs and stakeholders' expectations. This course intends to provide an understanding of the product and service development process elements and the factors influencing the execution of the process.

### **EMEM 529: Capstone Project**

The Capstone Project (CP) is designed to be reflection of a culminating set of personal, academic, and professional experiences. Students work in teams to apply synthesize knowledge and skills acquired during the course of their education to solve design, construction and operational problems with real world constraints and relevant to industry. The requirement is that projects must focus on and draw upon selected engineering and management principles and concepts in addressing the challenge. In addition, students will learn how to apply and implement theory in an organizational setting and to develop team-based skills and learn how to communicate technical issues to a variety of personnel in an organization.

## Elective Courses

### **EMEM 509: Systems Engineering**

This course explores a framework encapsulating the entire systems engineering discipline and addresses the topics of systems engineering relevant to all professions associated with the complex human-made systems. The course identifies methods for thinking about large, complex problems as an integrated whole, capturing the problem and documenting it systematically; then decomposing the problem into smaller units that can be designed, built, and integrated to achieve the desired result.

### **EMEM 527: Globalization and Engineering**

The course focuses on the primary knowledge areas and essential competencies required for successful engineers to live and work in today's global marketplace. The course will examine individual and cultural differences and how they impact communication and team dynamics. These topics are central to international and multicultural engineering teams. Students that complete the course will be able to understand sources of conflict that can arise in multicultural teams and effectively use the tools and resources learned in class to manage individual and team motivation and minimize or effectively deal with conflict, while harvesting the benefits of diversity as they work on a real world virtual team project, producing effective solutions to challenging engineering problems.

## EMEM 538: Knowledge and Innovation Management

Knowledge is considered as one of the most important resources of modern organizations, leading to successful implementation of organizational changes, generation of innovation, and attainment of sustainable competitive advantage. This course, therefore, aims at understanding and implementing concepts and management practices that refer to the effective acquisition, processing, and use of knowledge resources in a way that allows organizations to learn, innovate, adapt to changes occurring in their internal and external environment, and achieve high performance.

## EMEM 539: Big Data and Information Management

The course deals with the use of Big Data methods and Techniques to drive Business Analytics, to conduct inference and to support management decisions; it also deals with the essence of Information Management, traveling from the generation of information to its distribution and passing through its collection, technology, representation and processing. The course includes a broad collection of subjects. The material blends theory and practice, through several examples, illustrates techniques, and uses tools that help apply theoretical concepts. Emphasis is given in group work and on hands-on experience materialized through intriguing projects and extensive practice in the Lab with applied examples.

## EMEM 541: Operations Research Methods

This course will continue the approach followed in the Engineering Decision Tools course in order to analyze more Operations Research methods and algorithms. The main target is always to show students how to formulate and solve business and engineering problems, using mainly the MS Excel Solver, add-in programs and other software packages. The course will cover the following topics and models:

- Multiple-Criteria Decision Models: Goal Programming Models
- Waiting Line/Queuing Models, Queuing Network Models and their applications in Service Systems and Manufacturing Systems.
- Markov Decision Processes
- Monte Carlo Simulation and Simulation Modeling, Optimization in Simulation

## EMEM 543: Quality and Lean Management

The terms Quality and Lean are recognized as the key for the companies which want to satisfy their customer and efficiently manage their resources. The aim of Quality Management is to produce more reliable products and services by decreasing the variability. And the aim of Lean on the other hand is to increase the productivity by value creation and elimination of waste. The objective of this course is to teach students the definition of both quality and lean with differences and similarities and their implementation in production and service industries. The course covers the general concepts and principles of quality management and lean production such as customer focus, value creation, process management, value stream mapping, waste removal, visual management and continuous improvement.

# The Capstone Project

The guidelines presented herein form a manual designed to provide you with a quick reference for planning, preparation, and compilation of your Capstone Project (CP) of the Master in Engineering Management (MEM) Program, a joint effort of the School of Engineering and Digital Sciences (SEDS) and the Graduate School of Business (GSB) at Nazarbayev University (NU). In this manual, explanations of form and style, as well as a wide range of suggestions and advice, are offered for serving this goal. It is among the aims of this document to clarify the rules and explain possible options in areas where decisions about form and layout are at your discretion.

According to the MEM Program Guide,

*“The capstone project is designed to be the reflection of a culminating set of personal, academic, and professional experiences. Students work in teams to apply synthesized knowledge and skills acquired during the course of their education to solve design, construction and operational problems with real world constraints and relevant to industry.”*

The capstone project is an end-of-program assessment exercise designed to ensure that the graduates of the program have successfully met all their program learning objectives. The capstone project is thus used in MEM primarily for *summative* purposes. The project culminates in a team report (capstone project) that is publicly defended. Submission of a CP report and completion of this 16 ECTS module with a letter grade is a graduation requirement for MEM.

The CP provides an opportunity for the students to plan and execute a major applied project and thus demonstrate mastery of the technical and managerial skills required in their chosen profession. The CP is a unique exercise and successful completion in the allotted timeframe depends on prior preparation, careful time management and strict adherence to project timelines.

The target audience of this guideline document includes all members of the NU community associated with the MEM Program. While the document is intended to be a comprehensive overview of the general CP requirements for MEM, students and faculty must follow the specific instructions contained within the Capstone Module Guide issued by SEDS and abide by the Graduate Policies and Procedures of NU in force during the lifetime of the program.

Students are advised to work with their academic advisors to ensure that they are current with all existing guidelines during the course of their studies.

Each student of the MEM program must perform the capstone project within a team of 3 to 4 students. The capstone is a semester-long design project which satisfies the Capstone Project requirements and meets the MEM graduation requirements. The main objectives of the Capstone Project are as follows:

- To let students familiarize themselves with the design process in the industry and prepare students for future employment after graduation.
- To train students the skills of problem solving, creative thinking, project planning and teamwork through the conduct of a challenging design project.
- To assess the learning outcomes of the whole degree program in terms of applying and synthesizing the knowledge acquired in previous courses to solve real world problems.

Finally, it is important that you read the entire manual **before** you begin preparing your manuscript so that you understand the format and purposes behind the rules.

## Aims and Objectives

The capstone project must have a substantial research component and present a solution to an actual problem of a local company which is found in cooperation with the Career and Advising Center (CAC) of NU. The project culminates in a team report (capstone project) that should be, at a minimum, fifty pages long. The report is written using proper academic and stylistic writing conventions, including carefully documented primary and/or secondary sources, and is publicly defended.

Students enroll in the course during their final MEM semester and work with their advisor on defining a capstone project statement and a formal proposal. By mutual consent, this process may start informally earlier (in Semester 3) with consultations between students and potential advisors and especially with the companies.

Students must follow the guidance of their advisors, including submitting all required components of the capstone project process. Students should not expect to submit a final product at the end of the module without having completed each stage of the capstone project as outlined. The MEM program is not required to accept CP reports that have not undergone careful review and vetting at every stage of the process.

## Capstone Project Definition & Registration

A formal capstone project definition is required before students move on to the next stage of the process. The proposal should provide a clear and succinct description of the problem addressed, the proposed methodology and the expected outcomes. The formal proposal should not exceed five pages.

Drafting the proposal is considered a learning process and may go through a number of iterations to refine the statement and define the expected outcomes. The formal capstone project proposal also serves as an informal contract between the MEM program and the students on the scope of work agreed for completion.

The proposal should explain the question or problem to be investigated and present evidence that the question or problem merits investigation. It should show that the student has read the relevant and recent literature on the subject and it should contain a list of resources consulted during the preliminary stages of research. In general, the capstone project proposal should include an indicative literature review, a clear statement of purpose of the project, and a preliminary assessment of the tools needed to design a solution. *Capstone project faculty must approve the proposal.*

*The template of this document can be found in Appendix II.*

## Preparing the Capstone Project

Capstone project preparation entails a partnership between the students and their CP advisor, to ensure careful monitoring and coordination of the process and useful feedback. MEM students are encouraged to ask other NU faculty and professionals with relevant expertise to volunteer as capstone project readers and to provide feedback on drafts of capstone project sections. CP reports are in general expected to contain the following elements.

<b>Abstract:</b>	Describes succinctly the purpose of the project, the methodology used, and the findings and conclusion in 150-200 words.
<b>Introduction:</b>	Sets the general context for the project, the justification and the motivation behind the problem chosen and concludes with a clear and unambiguous statement of the specific questions to be addressed.
<b>Literature Review:</b>	Reviews the literature that is relevant to the problem and focuses on how similar research questions have been addressed before. It provides the current state of knowledge as it relates to the project's specific research question and identifies gaps in the literature.
<b>Theoretical Framework:</b>	Develops the theories or models to be used in the study and shows how the team has developed testable research hypotheses.
<b>Methodology:</b>	Describes how the team will test their hypotheses, the means by which data will be collected and the analysis methods that will be used for their processing.

<b>Findings:</b>	Describes the results of the study, i.e. the direct observations of the team as well as the team's interpretation and discussion of the results of their research. The findings should conclude with directions for future study and research of the capstone project problem.
<b>References:</b>	Lists the references cited in the document and it must be formatted according to MEM's prescribed style guide.

Capstone project formatting should be in strict accordance with the instructions included in the Style Guide of the CP project report (uploaded in Moodle) to ensure uniformity across the program. Appropriate stylistic formatting and preparation of the document is the team's responsibility. Team papers that do not follow the prescribed style rules will not be accepted.

## Submission and Approval

Once a capstone project report is approved by the CP advisor, it will be publicly presented and graded based on the format of the MEM CP grading rubric that appears as an addendum in the official Capstone Module Guide issued by the SEDS.

The grade is on a categorical scale of A through F. An A is given to those reports that demonstrate excellence in form and execution worthy of publication in a scholarly academic journal or an international conference.

The final manuscript (in pdf format) must be submitted to the MEM Online Library / Capstone project Repository, free of spelling, grammar and syntactical errors and incorporating all comments and corrections suggested during the presentation of the report. This is done by the supervising professor or the Program Director and *not* the student, within one month of the module completion date.

Exceptional reports that receive a grade of A, may be eligible for a prominent position within the MEM Online Library's Capstone Projects collection. In order for a report to be considered for this honor, it must be recommended by the faculty advisor, the Program Director and the SEDS Dean.

In all cases, students should be aware of the crucial importance of attribution for direct quotations, paraphrases, or the source of ideas that are used in their manuscripts. The use of media (images, video, audio, and datasets) should be done with the copyright holders permission. *The general rule is, when in doubt, cite.* Students are advised to consult with librarians in the NU Main Library in a timely fashion if their project and their report involves significant amounts of copyrighted media.

## Unsuccessful Capstone Project

Students who do not successfully complete their capstone project during the allotted timeframe or who receive a failing grade may be allowed an extension and a second chance to present their report. In order for students to be allowed an extension, their advisor must countersign their petition for the Dean of SEDS to review. In the event the petition is granted, an incomplete grade will be issued temporarily.

If a student or a team fails to meet the extension deadlines, the original capstone course grade will either remain as a failing grade or as a withdrawal, depending upon the documentation the student or the team is able to submit.

For students that have failed the capstone module, each new attempt may require them to register and pay tuition fees for the new course.

All students have the right to appeal for issues related to the CP module in accordance with the NU Graduate Program Policies and Procedures in effect.

In some cases, a second reader will be chosen by the Program Director or the SEDS Dean to review the capstone project and independently grade it using the program-approved rubric. The second reader will have one week to review and respond.

## Faculty Advisor Role

Faculty advisors in the CP module are responsible for:

- Engaging with student teams early on to facilitate the design of the capstone project and to ensure that the topic chosen can serve as a summative assessment tool for MEM.
- Directing the initial stages of the capstone project proposal and providing detailed feedback on refining the problem statement and defining the expected outcomes.
- Vetting the proposal before a team moves on to the next stage of the process.
- Providing students with extensive in-text comments on drafts of the final report.
- Approving the final manuscript and forwarding it to the Program Director before the public defense and examination.
- Contributing to the final CP grade using the program-approved rubric.
- Reporting to the Dean of SEDS when a student fails the CP module or does not complete it in the allotted timeframe and indicating the reasons for the failure.
- Working with students who are granted an extension to ensure completion within the allotted timeframe.
- Submit the final corrected manuscript to the Program Director, the Dean of SEDS and the MEM Capstone project Repository along with a possible recommendation for display on the MEM Online Library.

## Program Director's Role

The Program Director is responsible for:

- Ensuring that a copy of this manual along with the official module and style guides are accessible to the MEM students in a timely fashion.
- Keeping all faculty who participate as advisors in the capstone module appropriately informed.
- Vetting all capstone project proposal to ensure that expectations and requirements are consistent across projects.
- Monitoring and tracking all failures and ensuring that faculty are reporting the reason for failing grades.
- Approving all final manuscripts, securing the SEDS Dean's signature, and submitting them to the MEM Online Library.

**NOTE:** All documents relevant to the Capstone Project: The Capstone Project Guide in which the Capstone Project Registration Form is included in its Appendix, the Style Manual of the Capstone Project, the Capstone Project Timeline (which gives the dates of the various stages of the Capstone Project Assessment) and the License Agreement are accessible to the MEM students and the instructors via Moodle.

# Appendices

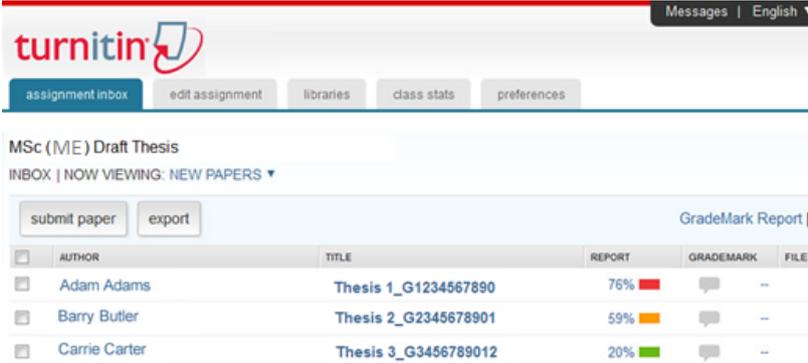
## Appendix I - Turnitin

Turnitin is a web-based originality checking service that is used by many universities worldwide to prevent plagiarism. When a student's work is submitted to Turnitin it is matched against millions of internet pages, electronic journals, books, and a database of all previously and concurrently submitted assignments. Turnitin then generates an originality report providing a summary of matching or similar text found in the submitted work. Turnitin can be used to check sources that have been correctly acknowledged and cited.

The higher the percentage indicated on the originality report, the greater the amount of text copied. The similarity percentage index ranges from 0% to 100% and is specified by distinct Colors:

- **Blue** (No matching words)
- **Green** (1 - 24% similarity index)
- **Yellow** (25 - 49% similarity index)
- **Orange** (50 - 74% similarity index)
- **Red** (75 - 100% similarity index)

Acceptable ranges for plagiarism using Turnitin is ideally below 20%. The figure below illustrates a sample originality report.



The screenshot shows the Turnitin interface for an 'MSc (ME) Draft Thesis' assignment. It displays a table of submitted papers with their respective similarity percentages and color-coded indicators. The table includes columns for Author, Title, Report, GradeMark, and File.

	AUTHOR	TITLE	REPORT	GRADEMARK	FILE
<input type="checkbox"/>	Adam Adams	Thesis 1_G1234567890	76% <span style="color: red;">■</span>		--
<input type="checkbox"/>	Barry Butler	Thesis 2_G2345678901	59% <span style="color: orange;">■</span>		--
<input type="checkbox"/>	Carrie Carter	Thesis 3_G3456789012	20% <span style="color: green;">■</span>		--

**Master of Engineering Management**  
**CAPSTONE PROJECT REGISTRATION & PROJECT DEFINITION FORM**  
 Academic Year 2019-2020

	Member 1	Member 2	Member 3	Member 4
<b>Full Name*</b>				
<b>E-mail*</b>				
<b>Student ID*</b>				
<b>Phone Number</b>				
<b>Signature*</b>				

\*Compulsory fields

<b>Project Title</b>

<b>Project Definition</b>
<ol style="list-style-type: none"> <li>1. <u>Statement of the Problem</u></li>   <li>2. <u>Current Status</u></li>   <li>3. <u>Objectives &amp; Outcomes</u></li>   <li>4. <u>Proposed Methodology</u></li> </ol>

Project Supervisor(s)	
PRINCIPAL SUPERVISOR	CO-SUPERVISOR(S)

Project Committee		
Member 1	Member 2	Member 3

Supervisor's Comments

Please read the copyright warning, sign & date this form in the presence of your supervisor, and leave with your supervisor to convey to the Program Director.

**COPYRIGHT WARNING**

*By signing this form, students agree that the students are solely responsible for the contents of the project & thesis. The students agree to acknowledge and reference any material from other sources and to obtain written permission from the copyright holder for all significant portions of graphical, pictorial or textual material copied or quoted. The students acknowledge that neither Nazarbayev University nor the staff accepts any responsibility for any and all non-compliance with this copyright acknowledgement.*

I agree to supervise the students named above. I have also witnessed the students' signatures and dates above

**Principal Supervisor's signature (must be signed)**

\_\_\_\_\_  
NAME:

DATE:

**To be submitted to the MEM Director by .**

For Official Use Only			
MEM Director		Date Received:	
Remarks:			

## Appendix III –Declaration Form

The signed declaration form that follows should be first page after your report's cover sheet

### DECLARATION

I hereby, declare that this manuscript, entitled "*title of Capstone Report*", is the result of my own work except for quotations and citations which have been duly acknowledged.

I also declare that, to the best of my knowledge and belief, it has not been previously or concurrently submitted, in whole or in part, for any other degree or diploma at Nazarbayev University or any other national or international institution.

(signature of author)

-----  
Name:

Date:

### Definitions:

Conflict of interest - refers to a conflict between official University duties and private interests and personal relationships, where the private interests or personal relationships could improperly influence the way in which a person carries out their official duties.

Perceived conflict of interest - where a reasonable person might perceive that such improper influence as described above could exist.

Personal relationships - relationships with individuals or people that extend outside of the University or University duties, or a relationship where a reasonable person might perceive that there could be some bias, either positive or negative, resulting from that relationship. These include relationships with:

1. immediate family, e.g. spouse or partner, parents, children, step-children, etc.;
2. close relatives, e.g. aunts, uncles, cousins, nephews, nieces etc.;
3. rivals, e.g. competitors or persons with whom one has a history of serious conflict or enmity;  
and
4. all other relationships that could introduce bias in carrying out official duties.

Private interests - refers to any interests that involve potential gain or loss (financial or non-financial) for an individual or for any other person or organization that individual may wish to benefit (e.g. family, friends, associates) or disadvantage (e.g. competitors, rivals).

### Rules and Guidelines:

1. All individuals are responsible for identifying, declaring, and managing conflicts of interest that apply to them.
2. Conflicts of interest may affect or have the appearance to affect sound and professional judgement adversely. Conflicts of interest or perceived conflicts of interest must be declared and managed to ensure integrity and transparency.
3. Staff members, students and other individuals who are charged with carrying out University activities and functions have a responsibility to declare and manage conflicts of interest as they arise. When declared, the conflict of interest should be avoided. Where this is not possible, action must be undertaken to ensure that the conflict (or perceived conflict) is managed in a transparent and appropriate manner.
4. Supervisors, chairs of committees/panels/groups and other responsible parties are accountable for ensuring that declared conflicts of interest, real or perceived, are evaluated and managed appropriately.
5. Declarations of conflict of interest should be made by individuals in writing to the relevant supervisor, chair of a committee/panel/group, other relevant person, or body as soon as the conflict is identified. Where circumstances prevent an immediate written declaration (e.g. conflict arises during a meeting), a verbal declaration should be lodged and, if possible, formally noted (e.g. in minutes of the meeting).

6. Where a supervisor, chair of a committee/panel/group, other relevant person or body becomes aware of a conflict of interest (or perceived conflict of interest) that has not been declared they should discuss the matter with the individual and take appropriate actions.
7. The best way in which to handle a conflict of interest is to avoid it. Where it is not possible to avoid a conflict of interest, the MSc CEE committee, the Head of Department, the School's Vice-Dean should be responsible for assessing the risk and taking appropriate actions.

