Module Handbook of Informatics and Control in Technical systems

Module designation	***MPA 101 - Machine Learning***
Semester(s) in which the module is taught	*Year 1, Fall semester (Semester 1)*
Person responsible for the module	*PhD. Associate Professor Leyla Muradkhanli* *leyla.muradkhanli@bhos.edu.az* *BHOS White City Building, Room 303* *99412 5210000 ext. 33230*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Linear algebra, Probability and statistics, Calculus, Data structures and algorithms*
Module objectives/intended learning outcomes	• *Possess advanced theoretical understanding of machine learning principles, algorithms, and computational learning theories.* • *Understand the mathematical and statistical foundations underlying data-driven modeling and analysis.* • *Apply machine learning techniques to solve complex engineering and scientific problems.* • *Use modern software tools and frameworks to implement, train, and evaluate machine learning models.* • *Perform data preprocessing, feature engineering, and model validation using appropriate metrics and methodologies.* • *Integrate machine learning solutions into multidisciplinary projects, considering uncertainty, reliability, and ethical implications.* • *Demonstrate autonomy in learning and applying emerging machine learning technologies.* • *Critically assess the applicability and limitations of machine learning methods in real-world contexts.* • *Engage in continuous professional development to stay current with advancements in machine learning and related fields.*

Content	• ***Introduction to Machine Learning -*** *Definition and scope**;** Real-world application; Types of learning: Supervised**,** Unsupervised**,** Reinforcement* • ***Data Preparation and Processing -*** *Data cleaning and handling missing values**;** Train-test split and cross-validation**;** Evaluation metrics (accuracy, precision, recall, etc.)**;** Python libraries: pandas, numpy, scikit-learn* • ***Supervised Learning – Regression -*** *Linear Regression (single & multiple variables)**;** Polynomial Regression* • ***Supervised Learning – Classification -*** *Logistic Regression (binary & multi-class)**;** k-Nearest Neighbors (k-NN)**;** Decision Trees and Random Forests**;** Support Vector Machines (SVM)* • ***Unsupervised Learning -*** *Clustering: k-Means**;** Dimensionality Reduction: Principal Component Analysis (PCA)* • ***Neural Networks -*** *Perceptron and feedforward networks**;** Activation functions and backpropagation* • ***Reinforcement Learning -*** *Basic concepts and applications*
Examination forms	*Final - 40%* *Assignment – 30%* *Quiz - 15%* *Project - 15%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] Understanding Machine Learning: From Theory to Algorithms by Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press, 2014.* *[2] Machine Learning with PyTorch and Scikit-Learn : Develop machine learning and deep learning models with Python by Sebastian Raschka, Yuxi (Hayden) Liu, Vahid Mirjalili, Packt Publishing, 2022.* *[3] Machine Learning. An Algorithmic Perspective, Stephen Marsland, Second edition, CRC Press, 2015.* *[4] Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido, O'Reilly Media, 2016.* *[5] Neural Networks and Deep Learning, Charu C. Aggarwal, Springer, 2018.* *[6] D. Barber, Bayesian Reasoning and Machine Learning, Cambridge University Press 2012.* *[7] Christopher M. Bishop, Pattern recognition and Machine Learning, Springer, 2006.* *[8] Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Cambridge University Press, 2020.* *[9] K.P. Murphy, Machine Learning: a probabilistic perspective, MIT Press, 2012.*

–Module designation	***MPA 103 - Advanced Process Automation Systems Design***
Semester(s) in which the module is taught	*Year 1, Fall semester (Semester 1)*
Person responsible for the module	*Lecturer Yelmar Aliyev* *yelmar.aliyev@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, quiz, midterm, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Control theory*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* *• Understand advanced process automation systems, including both traditional and modern control architectures.* *• Design, implement, and interface various control elements and devices such as regulating valves, variable speed drives, and HART devices.* *• Emphasize safety and efficiency in the design and operation of automated systems.* *• Document and visualize process systems using diagrams and operator graphics for effective monitoring and communication* *• Apply advanced control techniques, including multi-loop and model predictive control, to industrial processes.* *• Implement control strategies in real-world scenarios such as inventory control, batch processing, and distillation systems.* *• Simulate complex process behaviors and address non-linearities and other challenges in automation system design.*
Content	*• Background and Historical Perspective* *• Final Control Elements Design* *• Field Wiring and Communications* *• Process Systems Documentation* *• Operator Graphics* *• Single-loop Control* *• Tuning and Loop Performance* *• Multi-loop Control* *• Model Predictive Control* *• Process Simulation*

Examination forms	*Final - 40%* *Quizzes - 20%* *Midterm - 30%* *Class activity - 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*Main Textbook:* *[1] Control Loop Foundation – Batch and Continuous Processes: Terrence Blevins and Mark Nixon, 2011, 425 pages.*

Module designation	***MPA 105 - Advanced Optimal Control***
Semester(s) in which the module is taught	*Year 1, Fall semester (Semester 1)*
Person responsible for the module	*Lecturer Nijat Hasanov* *nijat.hasanov@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, quiz, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 240 h = 168h extracurricular hours + 72h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 14 h/ week*
Credit points	*8 ECTS*
Required and recommended prerequisites for joining the module	*Control theory, Differential equations, Linear algebra, Process control*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Demonstrate knowledge and understanding of the students about the existing and most popular methods of optimal control and assess them according to their computation complexity, efficiency and quality of control.* • *Be able to analyze a given practical problem (plant, dynamical system and the need for optimal control) and to decide about the most appropriate method and algorithm to be applied* • *Be able to create concrete solutions for optimal control by using MATLAB, its instructions and its programming language;*
Content	• *Introduction* • *Calculus of Variations Basics* • *Optimal Control Problem Formulation* • *Pontryagin's Maximum Principle (PMP)* • *PMP Applications* • *Linear Quadratic Regulator (LQR)* • *Dynamic Programming* • *Applications in Robotics & Mechanics* • *Constraints in Optimal Control* • *Discrete-Time Optimal Control* • *Numerical Methods for Optimal Control Project Presentations & Wrap-Up*
Examination forms	*Final - 40%* *Quizzes - 20%* *Laboratory - 20%*

	Project - 17% *Class activity - 3%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] Stephen Boyd and Craig Barratt, Linear Controller Design: Limits of Performance, 1991 by Prentice-Hall, 16 Chapters, 405 pages.* *[2] Moritz Diehl, Lecture Notes on Optimal Control and Estimation, Lecture Notes, July, 2014, 12 Chapters, 97 pages.* *[3] Claes Trygger and Petr Ogren, Optimal Control, Stockholm , Sweden, 2010, 10 Chapters, 140 pages*

Module designation	***MPA 107 - Communication Networks***
Semester(s) in which the module is taught	*Year 1, Fall semester (Semester 1)*
Person responsible for the module	*Lecturer Novruz Bahramov* *yelmar.aliyev@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 h = 102h extracurricular hours + 48h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study =8.5 h/ week*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Computer networks, Programming for Engineers*
Module objectives/intended learning outcomes	*After succeeding in this subject, the students will be able to:* • *Explain core networking models (OSI/TCP-IP), encapsulation, and key performance metrics.* • *Design and address small networks with IPv4/IPv6; perform subnetting.* • *Configure and verify basic switching (VLANs/trunks) and routing (static, single-area OSPF).* • *Implement baseline services and security: DHCP, DNS client settings, secure device access, and segmentation.*
Content	• *Introduction to TCP/IP Networking, Fundamentals of Ethernet LANs, Fundamentals of WANs and IP Routing* • *Using the Command-line interface, Analyzing Ethernet LAN Switching, Configuring Basic Switch Management, Configuring and Verifying Switch Interfaces* • *Implementing Ethernet Virtual LANs* • *Spanning Tree Protocol Concepts, RSTP* • *Inter VLAN routing* • *Perspective on IPv4 Subnetting, Analyzing Classfull IPv4 Networks, Analyzing Subnet Masks, Analyzing Existing Subnets* • *Operating Routers, Configuring IPv4 Addresses and Static Routes, IP Routing in The LAN* • *Understanding OSPF Concepts, Implementing OSPF, OSPF Network Type and Neighbors* • *Fundamentals of IP Version 6, IPv6 Addressing and Subnetting, Implementing IPv6 addressing on Routers, IPv6 Routing* • *Fundamentals of Wireless Networks, Analyzing Wireless Architectures*

	• *Securing Wireless Networks, Building a Wireless LAN*
Examination forms	*Final - 40%* *Project - 30%* *Laboratory - 30%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] Data Communications and Computer Networks: A Business User's Approach, Seventh Edition Curt M. White, 2014;* *[2] Todd Lammle - CCNA Routing and Switching Study Guide – 2013;* *[3] James F. Kurose and Keith W. Ross , Computer Networking - A Top-Down Approach Featuring the Internet, 6th Edition , 2012 Addison Wesley;* *[4] Odom W. - Cisco CCNA Routing and Switching 200-120 Official Cert Guide Library – 2013* *[5] Andrew S. Tanenbaum, Computer Networks, 5-th Edition,. Prentice Hall, 201 [2] Alan S. Morris. Measurement and Instrumentation Principles. Third Edition. Butterworth-Heinemann, 2001.* *[6] CCNA 200-301 Official Cert Guide - WENDELL ODOM*

Module designation	***MPA 109 - Methodology of Scientific research***
Semester(s) in which the module is taught	*Year 1, Fall semester (Semester 1)*
Person responsible for the module	*Lecturer Tapdig Dunyamali* *tapdig.dunyamali@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, seminar, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 h = 102h extracurricular hours + 48h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Seminar: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study =8.5 h/ week*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	• *Basic understanding of scientific principles – Familiarity with how scientific inquiry and experimentation work.* • *Introductory statistics – Knowledge of mean, median, standard deviation, and basic hypothesis testing.* • *Academic writing skills – Ability to write structured reports and summarize information clearly.* • *Critical thinking and analysis – Capability to evaluate and compare different ideas and arguments logically.* • *Basic computer skills – Competence in using word processors, spreadsheets, and data visualization tools.* • *Familiarity with research databases – Understanding how to search for and reference academic literature.*
Module objectives/intended learning outcomes	• *Learning how to choose topic and make proposal* • *Develop a thorough understanding of various research methodologies and their applications* • *Acquire practical skills in designing, conducting, and analyzing scientific research* • *Enhance critical thinking and analytical abilities in evaluating research literature* • *Ensure proficiency in adhering to ethical standards and best practices in research* • *Apply learned methodologies to real-world research problems.* • *Engage in hands-on projects that involve designing research studies, collecting and analyzing data, and presenting results.* • *Improving research and presentation skills before audience and questioning people*
Content	• *Introduction to Research Methodology – Overview of scientific research, its purpose, and key components like hypothesis and data analysis.* • *Formulating Research Questions – Learning to create clear, testable, and relevant research questions.*

	• *Topic Selection and Literature Review – Identifying research gaps and reviewing existing studies to refine the topic.* • *Developing Hypotheses – Understanding and formulating testable hypotheses for research.* • *Designing Experiments – Planning experiments, defining variables, and ensuring control and reliability.* • *Data Collection Methods – Exploring qualitative and quantitative methods for gathering data ethically.* • *Data Analysis – Applying statistical tools to interpret and summarize collected data.* • *Drawing Conclusions – Interpreting findings, discussing implications, and recognizing limitations.* • *Communicating Research Findings – Presenting research effectively through reports, posters, and presentations.* • *Research Ethics and Integrity – Understanding ethical responsibilities and addressing research misconduct.* • *Review and Feedback – Review of key concepts and methods.*
Examination forms	*Final exam – 35%* *Midterm exam – 25%* *Presentation – 30%* *Class activity – 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (35%)+Before Exam score will remain the same (60%)*
Reading list	*[1] Research Methodology, the aims, practices and ethics of science, by Peter Pruzan, 2016, International Publishing*

Module designation	***MPA 102 - Neural Networks & Deep Learning***
Semester(s) in which the module is taught	*Year 1, Spring semester (Semester 2)*
Person responsible for the module	*PhD.c Mirakram Aghalarov* *mirakram.aghalarov@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 240 h = 168h extracurricular hours + 72h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 14 h/ week*
Credit points	*8 ECTS*
Required and recommended prerequisites for joining the module	*Linear algebra, Probability and statistics, Machine learning*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Understand the principles and architectures of neural networks and deep learning models.* • *Demonstrate theoretical knowledge of machine learning frameworks, learning algorithms, and performance evaluation techniques.* • *Apply deep learning tools and libraries (e.g., PyTorch) to build, train, and evaluate models for various data types.* • *Implement neural network architectures including convolutional networks, transformers, and regression models.* • *Use appropriate methods to tune and validate models for improved performance.* • *Select and apply suitable deep learning techniques to solve real-world problems across domains.* • *Demonstrate autonomy in learning and using emerging technologies in machine learning.* • *Critically assess model performance and limitations and communicate results effectively.* • *Engage in continuous professional development through hands-on projects and reflective practice.*
Content	• *Introduction to Machine learning (deep learning)* • *Understanding Learning* • *Machine Learning Algorithms* • *Introduction to Deep Learning* • *Deeper Networks* • *Convolutional Neural Networks* • *Wake-Up Session: Data Ethics and Protection* • *Deep Learning Optimization in IoT*

	• *Natural Language Processing* • *Natural Language Processing with transformers* • *Deep Learning in wild*
Examination forms	*Final - 40%* *Project - 30%* *Laboratory - 30%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] "Machine Learning with PyTorch and Scikit-Learn" (2022) by Sebastian Raschka* *[2] "Programming PyTorch for Deep Learning: Creating and Deploying Deep Learning" (2019) by Ian Pointer*

Module designation	***MPA 104 - Robust Control***
Semester(s) in which the module is taught	*Year 1, Spring semester (Semester 2)*
Person responsible for the module	*Lecturer Nijat Hasanov* *nijat.hasanov@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, selfstudy = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Control theory, Linear algebra, Differential equations*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Model and analyze uncertain systems using advanced mathematical and control-theoretic methods to predict and evaluate system behavior under parameter variations and uncertainties.* • *Apply robust control principles to evaluate system stability and performance using analytical and computational techniques such as small-gain theorem and structured singular value analysis.* • *Design and optimize robust controllers to ensure stability and performance for complex dynamic systems with structured and unstructured uncertainties.* • *Implement and validate robust control algorithms using MATLAB and related software tools through laboratory exercises and simulations.* • *Analyze and interpret experimental and simulated results, identifying limitations, trade-offs, and model assumptions in robust control applications.* • *Communicate technical findings and design outcomes effectively through laboratory reports, discussions, and presentations that demonstrate clarity, coherence, and professional standards.*
Content	• *Modeling of Uncertain Systems* • *Robust Stability Analysis* • *Robust Performance Analysis* • H_∞ *Design* • μ *–Synthesis* • *Robust Control of a Distillation Column* • *Modelling of Uncertain Control Systems*

	• *Robust Stability Analysis of Control Systems* • *Analysis of the Worst Performance of Control Systems* • *Design of Controllers*
Examination forms	*Final - 50%* *Laboratory - 27%* *Class activity - 3%* *Quiz - 20%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (50%)+Before Exam score will remain the same (60%)*
Reading list	***Required textbooks and course materials:*** *1. Gu, D.W., P.H. Petkov, M.M. Konstantinov. Robust Control Design with 2. MATLAB®, Second Edition. Springer, London, 2013.* ***Additional textbooks and course materials**:* *1. Liu, K.-Z., Y. Yao. Robust Control. Theory and Applications. Wiley, Singapore, 2016.*

Module designation	***MPA 106 - Machine Vision***
Semester(s) in which the module is taught	*Year 1, Spring semester (Semester 2)*
Person responsible for the module	*PhD. Associate Professor Leyla Muradkhanli* *leyla.muradkhanli@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 180h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, selfstudy = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Linear algebra, Calculus, Probability and statistics, Image processing*
Module objectives/intended learning outcomes	*Upon completion of this course, students should be able to:* • *identify basic concepts, terminology, theories, models and methods in the field of computer vision;* • *describe basic methods of computer vision related to multi-scale representation, edge detection, stereo, motion and object recognition;* • *design of a computer vision system for a specific problem;* • *gain experience of doing independent study and research in computer vision.*
Content	• *Introduction to Computer Vision* • *Image Preprocessing and Enhancement* • *Feature Detection and Matching Techniques* • *Feature Detection and Matching Techniques* • *Object Detection and Recognition* • *Image Segmentation* • *Deep Learning* • *Motion Analysis and Activity Recognition* • *Video Processing* • *Applications of Computer Vision*
Examination forms	*Final - 40%* *Project - 15%* *Laboratory - 30%* *Quiz - 15%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*

Reading list	***Textbooks***: *[1] Richard Szeliski, Computer Vision: Algorithms and Applications, 2nd ed., Springer, 2022. electronic version available on https://szeliski.org/Book* *[2] Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, 4th edition, Pearson, 2017. (available in BHOS library)* ***Additional Reading (Textbooks)*** *[3] D. Forsythe and J. Ponce, Computer Vision: A Modern Approach, 2nd ed., Pearson, 2012.* *[4] Richard Hartley, and Andrew Zisserman, Multiple View Geometry in Computer Vision, Cambridge University Press, 2008.*

Module designation	***MPA 108 - Advanced Signal Processing***
Semester(s) in which the module is taught	*Year 1, Spring semester (Semester 2)*
Person responsible for the module	*Lecturer* *vafa.mammadova@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 1*
Teaching methods	*Lecture, laboratory, quiz, class activity, project*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours****:* *Lecture: 24 h (2 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Linear algebra, Probability and statistics, Digital signal processing*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Apply mathematical and theoretical frameworks to model and analyze signals in time and frequency domains.* • *Implement and evaluate advanced signal processing techniques such as filtering, spectral analysis, and adaptive systems.* • *Use computational tools to simulate and process signals, including real-time data.* • *Critically assess the performance and limitations of signal processing methods in complex systems.* • *Interpret results and quantify uncertainty using analytical and data-driven approaches.*
Content	• *Review of Signals and Systems* • *Fourier and Laplace Transforms* • *Digital Signal Processing (DSP) Fundamentals* • *Filter Design (FIR, IIR)* • *Spectral Analysis* • *Adaptive Filtering* • *Multirate Signal Processing* • *Time-Frequency Analysis (Wavelets, STFT)* • *Applications in Communications, Control, and Biomedical Systems*
Examination forms	*Final - 40%* *Project - 15%* *Laboratory - 30%* *Quiz - 15%*

Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	***Main Textbooks:*** *1. Alan V. Oppenheim & Ronald W. Schafer – Discrete-Time Signal Processing, 3rd ed., Pearson* *2. Simon Haykin – Adaptive Filter Theory, 5th ed., Pearson* ***Additional Reading:*** *1. Proakis & Manolakis – Digital Signal Processing: Principles, Algorithms, and Applications, 4th ed.* *2. S. Mallat – A Wavelet Tour of Signal Processing, 3rd ed., Academic Press*

Module designation	***MPA 110 - Renewable Energy***
Semester(s) in which the module is taught	*Year 1, Spring semester (Semester 2)*
Person responsible for the module	*Lecturer Tapdig Dunyamali* *tapdig.dunyamali@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 1*
Teaching methods	*Lecture, laboratory, case study, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours****:* *Lecture: 24 h (2 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Calculus, Electrical engineering*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *To provide a comprehensive understanding of the principles and technologies behind various renewable energy sources, including solar, wind, hydro, geothermal, and biomass.* • *To equip students with the ability to analyze and evaluate the environmental and economic impacts of renewable and sustainable energy systems.* • *To develop basic skills for designing, optimizing, and implementing efficient renewable energy solutions.* • *To explore advancements in energy storage, and smart energy systems to enhance the reliability of renewable energy applications.* • *To familiarize students with global case studies and policy frameworks that drive the adoption of sustainable energy solutions.* • *To inspire innovation and critical thinking in addressing challenges associated with the global transition to sustainable energy practices.* • *To explore the best examples of developed and developing countries invested and currently investing in this energy types.*
Content	• *Introduction to Renewable Energy Sources* • *Solar Energy Systems and Photovoltaics* • *Wind Energy Conversion Systems* • *Hydropower and Marine Energy*

	• *Biomass and Bioenergy* • *Geothermal Energy* • *Energy Storage and Grid Integration* • *Environmental Impact and Sustainability* • *Policy, Economics, and Global Trends* • *Emerging Technologies and Future Outlook*
Examination forms	*Quiz - 25%* *Midterm exam - 25%* *Project - 25%* *Presentation – 25%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (50%)+Before Exam score will remain the same (50%)*
Reading list	*1. "Energy Systems Engineering: Evaluation and Implementation" by Francis M. Vanek, Louis D. Albright, and Largus T. Angenent* *2. Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle*

Module designation	***MPA 112 - Energy Management***
Semester(s) in which the module is taught	*Year 2, Spring semester (Semester 2)*
Person responsible for the module	*Lecturer* *vafa.mammadova@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 1*
Teaching methods	*Lecture, seminar, quiz, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Seminar: 24 h (2 h /week)* *Lecture: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self -study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Electrical engineering, Electrical safety*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Apply advanced mathematical, computational, and control methods to model, analyze, and optimize energy systems across multi-domain technical environments.* • *Make justified, evidence-based engineering decisions for energy system management, evaluating technical, economic, environmental, safety, and sustainability implications.* • *Plan, lead, and manage energy projects while assessing risk and uncertainty, and take responsibility for outcomes and team performance.* • *Independently evaluate emerging energy technologies, maintain professional development, and implement strategies for lifelong learning in energy management.*
Content	• ***Introduction to Energy Management** – Overview of energy systems, efficiency, and multi-domain integration.* • ***Energy Resources and Technologies** – Conventional and renewable energy sources, generation principles.* • ***Energy System Modeling** – Mathematical and computational modeling of energy generation, storage, and distribution.* • ***Energy Monitoring and Data Analysis** – Signal acquisition, data processing, and performance metrics.* • ***Control and Optimization in Energy Systems** – Feedback control, load management, and system optimization techniques.* • ***Energy Efficiency and Conservation Strategies** – Methods for minimizing energy losses in technical systems.*

	• ***Risk, Uncertainty, and Reliability Analysis*** *– Predicting system behavior under uncertainty and evaluating reliability.* • ***Economic and Environmental Assessment*** *– Cost-benefit analysis, life cycle assessment, and sustainability evaluation.* • ***Project Management in Energy Systems*** *– Planning, leadership, team coordination, and stakeholder communication.* • ***Emerging Technologies and Innovation*** *– Smart grids, IoT integration, energy storage advancements, and AI in energy management.* • ***Case Studies and Best Practices*** *– Analysis of real-world energy management projects and strategies.* • ***Final Project Presentations and Review*** *– Integration of modeling, optimization, and decision-making in a capstone project.*
Examination forms	*Final - 40%* *Quiz - 30%* *Laboratory - 20%* *Class activity - 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] G. Boyle, Renewable Energy: Power for a Sustainable Future, 4th ed., Oxford University Press, 2020.* *[2] T. Ackermann (Ed.), Wind Power in Power Systems, 3rd ed., Wiley, 2012.* *[3] D. P. Kothari, K. C. Singal, R. Ranjan, Renewable Energy Sources and Emerging Technologies, PHI Learning, 2014.* *[4] F. Kreith and D. Y. Goswami, Handbook of Energy Efficiency and Renewable Energy, CRC Press, 2019.* *[5] S. P. Sukhatme and J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, 4th ed., McGraw-Hill, 2017.*

Module designation	***MPA 114 - Energy and Control***
Semester(s) in which the module is taught	*Year 2, Spring semester (Semester 2)*
Person responsible for the module	*Lecturer* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 1*
Teaching methods	*Lecture, project, quiz, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 36 h (3 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Calculus, Electrical engineering*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Apply mathematical and control theory principles to model and analyze energy systems.* • *Implement and evaluate control strategies for energy conversion and distribution systems.* • *Design and validate integrated energy-control systems that meet performance, safety, and sustainability requirements.* • *Use engineering tools and platforms to simulate, test, and optimize energy systems.* • *Make evidence-based decisions considering technical, economic, ethical, and environmental factors in energy and control applications.*
Content	• *Fundamentals of Energy Systems* • *Control Theory in Energy Applications* • *Modeling and Simulation of Energy-Control Systems* • *PID and Advanced Controllers* • *Smart Grid Technologies* • *Energy Conversion and Storage Control* • *System Integration and Validation* • *Safety, Reliability, and Risk Assessment* • *Project Planning and Management in Energy Systems* • *Case Studies and Emerging Technologies*
Examination forms	*Final exam – 40%* *Quiz - 20%* *Project – 25%*

	Class activity - 15%
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	***Main Textbooks:*** *1. William C. Dunn – Introduction to Instrumentation and Control Systems, Artech House* *2. D. P. Kothari & I. J. Nagrath – Modern Power System Analysis, McGraw-Hill* ***Additional Reading:*** *3. Karl J. Åström & Richard M. Murray – Feedback Systems: An Introduction for Scientists and Engineers, Princeton University Press*

Module designation	***PDG 102 - Higher Education Pedagogy***
Semester(s) in which the module is taught	*Year 1, Spring semester (Semester 2)*
Person responsible for the module	*Lecturer Narmin Ibrahimova* *nermin.ibrahomova@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, seminars, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 120 h = 84h extracurricular hours + 36h classroom* ***Classroom hours**:* *Lecture: 12 h (1 h /week)* *Seminar: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 7 h/ week*
Credit points	*4 ECTS*
Required and recommended prerequisites for joining the module	*No prerequisite course*
Module objectives/intended learning outcomes	*Upon completion of this course, students should be able to:* • *understand the notion and theories of education, explain different categories of pedagogy.* • *apply pedagogical ideas to the development of one's personal and professional growth, and to improve education* • *critically assess theories and the ability to select them* • *possess fundamental pedagogical knowledge for the solution of learning problems, misbehavior, demotivation* • *generate new ideas and implement them in practice* • *design individual and group projects and implement them* • *develop research skills* • *improve communication skills*
Content	• *Introduction to Pedagogy; Historical and Social Context of Education; Ancient Teaching Methods; Education System in Azerbaijan; Types and Processes of Education* • *Teaching Theories; Transactional Model of Teaching/Learning; Classroom Management & Teacher Effectiveness; Student Responsibility in Learning* • *Academic Learning Time; Pedagogical Cycle; Models of Effective Instruction* • *Types of Learning; Learning Styles; The Art of Explaining; Simplification & Complexity in Teaching* • *Educational Aims and Objectives in Higher Education; Overview of the Higher Education System* • *Domains of Learning; Bloom's Taxonomy; Active Learning Strategies; Behavioral Verbs for Learning Objectives; Teaching and Learning Models in Higher Education*

	• *Assessment, Measurement, and Evaluation; Types of Assessment; Observation and Evaluation in Higher Education* • *Learning Objectives; Definitions of Behavioral Verbs for Learning Objectives.* • *Classroom Planning; About the importance of lesson planning; Lesson Planning Ideas.* • *Managing the Teaching and Learning Process; The teacher- teacher's language using intuition; The teacher as researcher. Teachers' and Learners' language in the Classroom. Student Behavior. The Learners.* • *Communication Principles; The nature of classroom communication; Elements of professionalism, higher education management; Values in Higher Education Teaching.*
Examination forms	*Final - 60%* *Presentation - 20%* *Quiz - 20%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (60%)+Before Exam score will remain the same (40%)*
Reading list	*[1] Hayes, Amanda. Teaching Adults, Bloomsbury Publishing Plc, 2006.* *[2] Pamela A. Kramer. (2003). To develop a strong sense of professionalism.* *[3] Building Teaching Capacities in Higher Education: A Comprehensive International Model, and Mariane Frenay, Stylus Publishing, LLC 2010.* *[4] Harland, Tony, and Neil Pickering. Values in Higher Education Teaching, Taylor & Francis Group, 2010.* *[5] S. Saeed & D. Zyngier. (2012). How Motivation Influences Student Engagement. Journal of Education and Learning; Vol. 1, No. 2; 2012* *[6] Geoff Petty, Teaching Today. Nelson Thornes Ltd, 2009. Robert MacGregor, Modern Teaching Methods. Centre de formation d'enseignants Robert MacGregor, 2019.* *[7] Michael K. Russel, Peter W. Airasian, Classroom Assessment. McGraw Hill, 2012.*

Module designation	***MPA 201 - Mechatronics Systems***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Rashad Amirgunayev* *rashad.amirgunayev@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 h = 102h extracurricular hours + 48h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 8.5 h/ week*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Engineering mechanics, Control theory*
Module objectives/intended learning outcomes	*Upon completion of this course, students should be able to:* • *Learn Arduino based system design.* • *Write a program in C language and integrate it into the established system.* • *Analyze system outputs.* • *Learn sensors and their use.* • *Recognize mechanical and electronic materials in system design and learn to integrate them into the system.* • *Learn to control all parts included in the system through the program.*
Content	• *Arduino – Introduction to Arduino hardware, components, and basic setup.* • *Arduino Programming Basics – Learning fundamental programming logic and simple circuits.* • *Arduino Programming Basics – 2 – Exploring sensors, variables, and loops in Arduino.* • *Buzzer Usage – Understanding data processing and using buzzers for sound output.* • *Using a Potentiometer – Learning about variable resistors and sensor-based data control.* • *Tilt Sensor and Engineering Design Processes – Studying slope, gravity effects, and basic design principles.* • *Motors – DC Motor – Understanding motor operation and current direction in circuits.* • *Motors – Servo Motor – Learning servo control and differences between motor types.* • *Robot Arm Making – Designing and building a robotic arm using Arduino and motors.*

	• *Robot Arm Making (continued) – Completing robot arm assembly and testing.* • *LCD Display and Debugging – Using LCDs for output and learning system troubleshooting.*
Examination forms	*Final - 50%* *Project - 30%* *Class activity - 20%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (50%)+Before Exam score will remain the same (50%)*
Reading list	*[1] David G. Alciatore . Introduction to Mechatronics and Measurement Systems, 5th edition, 2019*

Module designation	***MPA 203 - Embedded Systems***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Rashad Amirgunayev* *rashad.amirgunayev@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, project, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 h = 102h extracurricular hours + 48h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 8.5 h/ week*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Digital electronics, Calculus*
Module objectives/intended learning outcomes	*Upon completion of this course, students should be able to:* • *Demonstrate foundational knowledge in microcontroller-based system design, including understanding of embedded architectures and control logic.* • *Apply programming skills to develop and integrate software solutions into hardware systems, using appropriate languages and tools.* • *Analyze and interpret system behavior through evaluation of outputs, performance metrics, and debugging techniques.* • *Understand and utilize sensors and related instrumentation for data acquisition and system control.* • *Identify and integrate mechanical and electronic components in system design, ensuring compatibility and functionality.* • *Control and coordinate system components through software, demonstrating proficiency in embedded system programming and real-time control.*
Content	• *Microprocessors and Microcontrollers – Introduction to microprocessor vs. microcontroller concepts and PIC16F84 architecture.* • *PIC16F84 Microcontroller Pins and Connections – Learning pin configuration, power, reset, and oscillator connections.* • *Computer Applications (PBP, Micro Code Studio, Proteus) – Using software tools for PIC programming and simulation. (Quiz)* • *Pic Basic Pro Commands – Understanding basic commands and program writing rules in Pic Basic Pro.*

	• *PIC16F84A Exercises I – Working with simple LED circuits using PIC16F84A.* • *PIC16F84A Exercises II – Continuing LED circuit applications with PIC16F84A. (Quiz)* • *PIC16F84A Exercises III – Learning to control LED circuits with button inputs (part 1).* • *PIC16F84A Exercises IV – Advancing button-controlled LED circuit applications (part 2).* • *PIC16F84A Exercises V – Completing button-controlled LED projects and refining logic. (Quiz)* • *PIC16F84A Input–Output Applications I – Practicing input and output unit integration with PIC16F84A.* • *PIC16F84A Input–Output Applications II – Expanding on input/output control exercises.* • *PIC16F84A Input–Output Applications III / Final Project – Final hands-on project combining all learned PIC16F84A skills.*
	Project - 50% *Quiz - 30%* *Class activity - 20%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (50%)+Before Exam score will remain the same (50%)*
Reading list	*[1] Alexander G Dean. Embedded Systems Fundamentals with ARM Cortex-M based Microcontrollers, 2017 (main textbook)*

Module designation	***MPA 205 - Robotics***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Vafa Mammadova* *vafa.mammadova@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lectures, laboratory work, quiz, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 h = 102h extracurricular hours + 48h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 8.5 h/ week*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Engineering mechanics, Linear algebra, Differential equations, Physics*
Module objectives/intended learning outcomes	*Upon completion of this course, students should be able to:* • *Apply principles of kinematics and control to analyze robotic systems.* • *Identify and compare different types of robots, including industrial, medical, surgical, swarm, and soft robots, and explain their applications.* • *Critically evaluate research papers on contemporary robotics topics and applications.* • *Analyze robotic systems in terms of safety, ethics, and compliance with international standards.* • *Explain how mathematical and theoretical frameworks support the operation and behavior of various robotic systems.* • *Assess safety standards, ethical considerations, and societal impacts of robotics, applying international regulatory frameworks*
Content	• *Introduction to Robotics – Overview of robotics history, classifications, components, and industry trends.* • *Actuators & Motion Mechanisms – Study of motors, mechanical transmissions, and motion principles.* • *Sensors & Perception – Exploration of robot sensing, measurement theory, and state estimation.* • *Configuration Space & Kinematics Foundations – Understanding robot motion representation and degrees of freedom.* • *Forward Kinematics – Applying transformation matrices and PoE formulas to model manipulator motion.* • *Quiz Week – Assessment covering kinematics and foundational robotics concepts.*

	• *Forward Kinematics (continued) – Extended practice with manipulator kinematics and motion analysis.* • *Inverse Kinematics – Solving for joint parameters, handling redundancy and singularities.* • *Control Systems and Feedback Mechanisms – Fundamentals of control theory, PID systems, and feedback loops.* • *Medical, Surgical, and Soft Robotics – Applications in healthcare, teleoperation, and soft robotic design.* • *Swarm and Industrial / Collaborative Robots – Multi-robot coordination, human-robot interaction, and industrial uses.* • *Safety, Ethics, and Standards in Robotics – Learning safety standards, risk assessment, and ethical implications.*
Examination forms	*Final - 40%* *Quiz - 30%* *Assignments - 20%* *Class activity - 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] Lynch, K. M., & Park, F. C., Modern Robotics: Mechanics, Planning, and Control, 1st ed. Cambridge, UK: Cambridge University Press, 2017.* *[2] N. Correll, B. Hayes, C. Heckman, and A. Roncone, Introduction to Autonomous Robots: Mechanisms, Sensors, Actuators, and Algorithms, MIT Press, Cambridge, MA, 2022.* *[3] J. E. Speich and J. Rosen, Medical Robotics, in Encyclopedia of Biomaterials and Biomedical Engineering, G. Wnek, ed., CRC Press, 2nd ed., 2008.* *[4] L. Garattoni and M. Birattari, “Swarm robotics,” in Encyclopedia of Electrical and Electronics Engineering, J. G. Webster, ed., John Wiley & Sons, Hoboken, NJ, 2016.* *iridia.ulb.ac.be* *[5] P. Lin, K. Abney, and R. Jenkins, eds., Robot Ethics 2.0: From Autonomous Cars to Artificial Intelligence, Oxford University Press, New York, NY, 2017.*

Module designation	***MPA 207 - Industrial Project***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Nijat Hasanov* *Nijat.hasanov@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Project, seminar, presentation*
Workload (incl. contact hours, self-study hours)	*Total workload: 120 h = 84h extracurricular hours + 36h classroom* ***Classroom hours**:* *Lecture: 24 h (2 h /week)* *Laboratory: 12 h (1 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 7 h/ week*
Credit points	*4 ECTS*
Required and recommended prerequisites for joining the module	• ***Undergraduate degree in a related discipline** — engineering, automation, computer science, informatics, or equivalent experience.* • ***Completion of core taught modules** — foundation courses in control/automation, systems engineering*
Module objectives/intended learning outcomes	• *Apply advanced mathematical, computational, and control principles to solve real-world engineering problems* • *Select and implement appropriate analytical, numerical, and experimental methods to evaluate system performance and validate results* • *Design, document, and validate complex engineering systems or subsystems, ensuring compliance with functional and safety requirements* • *Plan and conduct independent investigations, including literature review, experimentation, and data analysis* • *Demonstrate proficiency in using engineering tools, software platforms, and laboratory methods to implement and test solutions* • *Make justified engineering decisions considering technical, economic, ethical, and sustainability factors; manage project execution and team collaboration* • *Communicate technical ideas effectively through written reports and oral presentations; contribute to interdisciplinary teamwork* • *Reflect on personal learning, evaluate emerging technologies, and identify future development opportunities*
Content	• *Project definition and scope* • *Literature review and problem analysis* • *System modeling, design, and simulation*

	• *Implementation and testing* • *Evaluation and validation* • *Documentation and reporting* • *Final presentation and defense*
Examination forms	*Report – 70%* *Presentation – 20%* *Contribution – 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score 100%.*
Reading list	

Module designation	***MPA 211 - Management of Automation Projects***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Taghi Babazade* *Taghi.babazade@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 2*
Teaching methods	*Lecture, laboratory, quiz, project*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Technical documentation, Project management*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Design and managing automation projects that meet functional, safety, and economic requirements* • *Apply engineering tools, software platforms, and laboratory methods to implement and validate automation solutions* • *Make informed decisions in managing complexity, uncertainty, and risk in automation projects, considering technical, ethical, and sustainability factors* • *Communicate project goals, progress, and outcomes effectively to both technical and non-technical audiences; contribute to interdisciplinary teamwork* • *Develop and maintain a structured professional development plan, reflecting on emerging technologies and project management practices*
Content	• *Introduction to Automation Project Management* • *Project Lifecycle and Planning Techniques* • *Risk Assessment and Mitigation Strategies* • *Budgeting and Resource Allocation* • *Safety, Compliance, and Standards in Automation* • *Team Leadership and Communication* • *Documentation and Reporting Tools* • *Case Studies in Industrial Automation Projects* • *Emerging Trends and Technologies in Automation*

Examination forms	*Final exam – 40%* *Project – 30%* *Presentation – 10%* *Class activity – 10%* *Quiz – 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	***Main Textbooks:*** *1. Frank Lamb – Industrial Automation: Hands-On, McGraw-Hill* *2. Bela G. Liptak – Instrument Engineers' Handbook: Process Control and Optimization, CRC Press* ***Additional Reading:*** *1. PMI – A Guide to the Project Management Body of Knowledge (PMBOK Guide)*

Module designation	***MPA 213 - Automatic Control and Environmental management Systems***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Assoc. Prof.Erkin Ibrahimov* *Erkin.ibrahimov@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 2*
Teaching methods	*Lecture, laboratory, quiz, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Control theory, Calculus, Differential equations, Process Control*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Apply control theory and mathematical modeling to environmental management systems* • *Design and validate automated systems for environmental monitoring and control, ensuring compliance with safety and sustainability standards* • *Use engineering tools and platforms to implement, test, and optimize control systems in environmental applications* • *Make informed decisions in managing environmental automation projects, considering technical, ethical, and sustainability factors* • *Develop a structured professional development plan and critically evaluate emerging technologies in environmental automation*
Content	• *Introduction to Environmental Control Systems* • *Control Theory Applications in Environmental Engineering* • *Sensors and Actuators for Environmental Monitoring* • *Automated Waste and Emission Management Systems* • *Energy-Efficient Control Strategies* • *Compliance with Environmental Standards and Regulations* • *System Design, Simulation, and Validation* • *Emerging Technologies in Environmental Automation*

	• *Professional Development and Sustainability Planning*
Examination forms	*Final exam – 40%* *Midterm exam – 20%* *Lab work - 30%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	***Main Textbooks:*** *1. Bela G. Liptak – Instrument Engineers' Handbook: Environmental and Safety Instruments and Systems, CRC Press* *2. William C. Dunn – Introduction to Instrumentation and Control Systems, Artech House*

Module designation	***MPA 215 - Array Signal Processing***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Abid Karimli* *Abid.karimli@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 2*
Teaching methods	*Lecture, laboratory, quiz*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Digital signal processing, Linear algebra, Probability and statistics*
Module objectives/intended learning outcomes	*By the end of this course, students will be able to:* • *Apply mathematical and signal processing principles to model and analyze array-based systems* • *Implement and evaluate algorithms for beamforming, direction-of-arrival estimation, and spatial filtering* • *Use simulation tools to design and test array signal processing techniques in real-world scenarios* • *Quantify uncertainty and assess the performance of signal processing methods under varying conditions*
Content	• *Introduction to Array Signal Processing – Fundamentals, applications, and system overview.* • *Linear Algebra and Vector Space Concepts – Basics needed for array signal modeling and processing.* • *Signal Representation and Multi-Channel Systems – Time-domain and frequency-domain representations.* • *Beamforming Fundamentals – Delay-and-sum and conventional beamforming techniques.* • *Optimal and Adaptive Beamforming – MVDR, LCMV, and adaptive algorithms.* • *Spatial Filtering and Direction of Arrival (DOA) Estimation – MUSIC, ESPRIT, and subspace methods.* • *Array Calibration and Error Analysis – Sensor imperfections, uncertainties, and performance metrics.* • *Data-Driven and Machine Learning Approaches – PCA, ICA, and deep learning for array signal systems.* • *Simulation of Array Signal Systems – MATLAB/Simulink-based modeling and analysis.* • *Experimental Methods and Hardware Implementation – Sensor array testbeds, measurements, and validation.*

	• *Performance Evaluation and Uncertainty Quantification – SNR, resolution, and error bounds.*
Examination forms	*Final exam – 40%* *Quiz – 20%* *Lab work – 40%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] H. L. Van Trees, Optimum Array Processing: Part IV of Detection, Estimation, and Modulation Theory, Wiley, 2002.* *[2] B. D. Van Veen and K. M. Buckley, Beamforming: A Versatile Approach to Spatial Filtering, IEEE ASSP Magazine, 1988.* *[3] D. H. Johnson and D. E. Dudgeon, Array Signal Processing: Concepts and Techniques, Prentice Hall, 1993.* *[4] S. Haykin, Adaptive Filter Theory, 5th ed., Pearson, 2013.* *[5] H. Krim and M. Viberg, Two Decades of Array Signal Processing Research, IEEE Signal Processing Magazine, 1996.*

Module designation	***MPA 217 - Big data***
Semester(s) in which the module is taught	*Year 2, Fall semester (Semester 3)*
Person responsible for the module	*Lecturer Gunel Amrahova* *amrahova.gunel@bhos.edu.az* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Elective 2*
Teaching methods	*Lecture, laboratory, quiz, class activity*
Workload (incl. contact hours, self-study hours)	*Total workload: 180 h = 120h extracurricular hours + 60h classroom* ***Classroom hours**:* *Lecture: 36 h (3 h /week)* *Laboratory: 24 h (2 h / week)* ***Contact hours:*** *Examination preparation, consultation, self-study = 10 h/ week*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Probability and statistics, Data structures and algorithms*
Module objectives/intended learning outcomes	• *Understand Big Data Concepts – Define Big Data, its characteristics, evolution, and when to apply appropriate methods.* • *Classify and Analyze Data – Distinguish structured, semi-structured, and unstructured data and their sources.* • *Implement Big Data Technologies – Work with Hadoop, Spark, and NoSQL databases for data processing.* • *Perform Data Mining and Analysis – Apply Big Data mining, statistical analysis, machine learning, and visualization using Python and R.* • *Develop Real-World Big Data Solutions – Build end-to-end solutions with predictive analytics and cloud deployment.* • *Engage in Hands-on Labs and Projects – Apply practical tasks on datasets, platforms, and data-driven applications.* • *Critically Evaluate Big Data Technologies – Assess benefits, limitations, and ethical considerations of Big Data tools*
Content	• ***Introduction to Big Data** – Concept, significance, history, and 4Vs (Volume, Variety, Velocity, Veracity).* • ***Evolution of Data and Computing** – Historical development from traditional databases to modern Big Data platforms.* • ***Big Data Drivers and Problem Identification** – Reasons for Big Data prominence and identifying appropriate problems and solutions.* • ***Types and Sources of Data** – Structured, semi-structured, unstructured data and industrial/real-world sources.* • ***Big Data Architecture** – Components, hardware/software stacks, and platform selection for implementation.*

	• ***Big Data Mining and Analytics*** *– Techniques for extracting insights and developing data-driven strategies.* • ***Hadoop Fundamentals*** *– Installing, configuring, and using HDFS, MapReduce, and YARN.* • ***NoSQL Databases*** *– Overview, types, CAP theorem, ACID vs BASE, and hands-on with MongoDB.* • ***Introduction to Spark*** *– Core components (Spark SQL, Streaming, MLlib, GraphX) and advantages over Hadoop.* • ***Hands-on Spark Applications*** *– Deploying Spark on Databricks and performing analytics on real datasets.* • ***Developing End-to-End Big Data Solutions*** *– Integrating Hadoop, Spark, and NoSQL for practical applications.*
Examination forms	*Final exam – 40%* *Quiz – 30%* *Lab work – 30%* *Class activity – 10%*
Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (40%)+Before Exam score will remain the same (60%)*
Reading list	*[1] Dasgupta, N. (2018). Practical big data analytics: Hands-on techniques to implement enterprise analytics and machine learning using Hadoop, Spark, NoSQL and R. Packt Publishing. – Main Textbook for Practical Sessions* *[2] Capriolo, E., Wampler, D., & Rutherglen, J. (2012). Programming Hive: Data warehouse and query language for Hadoop. O'Reilly Media.* *[3] Chodorow, K., & Dirolf, M. (2013). MongoDB: The definitive guide. O'Reilly Media.* *[4] Karau, H., Konwinski, A., Wendell, P., & Zaharia, M. (2015). Learning Spark: Lightning-fast big data analysis. O'Reilly Media.* *[5] Karau, H., & Warren, R. (2017). High performance Spark: Best practices for scaling and optimizing Apache Spark. O'Reilly Media.* *[6] Mayer-Schönberger, V., & Cukier, K. (2013). Big data: A revolution that will transform how we live, work, and think. Eamon Dolan/Mariner Books.* *[7] McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and IPython (2nd ed.). O'Reilly Media.* *[8] Minelli, M., Chambers, M., & Dhiraj, A. (2013). Big data, big analytics: Emerging business intelligence and analytic trends for today's businesses. Wiley.*

Module designation	***MPA 209 - Scientific Internship***
Semester(s) in which the module is taught	*Year 2, Spring semester (Semester 4)*
Person responsible for the module	*Assoc. Prof. Naila Allahverdiyeva* Naila.allahverdiyeva@bhos.edu.az *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Independent research, report writing, presentation, seminar discussion, supervision meetings*
Workload (incl. contact hours, self-study hours)	*Total workload: 90h = 90h extracurricular hours* ***Contact hours:*** *Examination preparation, consultation, self-study = 7.5 h/ week*
Credit points	*3 ECTS*
Required and recommended prerequisites for joining the module	*Methodology of Scientific research*
Module objectives/intended learning outcomes	*Upon completion, students will be able to:* • *Apply advanced theoretical and practical knowledge from the Master's programme to design and execute an independent or supervised research project addressing modelling, control, estimation, or information‑processing challenges in multi‑domain technical systems.* • *Demonstrate the ability to conduct problem‑oriented, methodologically sound scientific investigations in control and informatics, using appropriate mathematical modelling, simulation, experimental methods, and validation procedures.* • *Formulate clear, technically rigorous research objectives, testable hypotheses, and methodologies aligned with academic standards in control theory, signal processing, system identification, or related informatics fields.* • *Collect, preprocess, analyze, and interpret experimental or simulated data relevant to control, sensing, communications or information‑processing topics; quantify uncertainty and assess results using suitable statistical and estimation techniques.* • *Prepare a professional‑level research thesis and associated documentation that conforms to institutional formatting, data‑management and ethical requirements, including reproducible code, datasets, and verification/validation records.* • *Present research findings effectively to specialist and non‑specialist audiences through technical reports, conference‑style presentations, and outreach summaries; tailor explanations of control and informatics concepts to the audience's level.* • *Collaborate with supervisors, multidisciplinary research teams, and external stakeholders while planning and managing project scope, schedule, resources, risk, and*

	reporting responsibilities; demonstrate responsibility for deliverables and team outcomes. • *Reflect critically on research outcomes to identify limitations, potential improvements, and pathways for future work or publication in control, robotics, industrial informatics, or related journals and conferences; maintain a personal development plan to guide continued professional growth.*
Content	• *Research topic selection and proposal development* • *Methodology planning and data collection techniques* • *Implementation and experimental work* • *Data analysis and interpretation* • *Documentation and report preparation* • *Research ethics, plagiarism prevention, and academic integrity* • *Interim reporting and supervisor feedback sessions* • *Final presentation and defense of research outcomes*
Examination forms	*Report – 50%* *Performance Evaluation by Supervisor – 50%*
Study and examination requirements	*Total: 100%* *Grading Scale:* *A (91–100), B (81–90), C (71–80), D (61–70), F (≤60)* • *Each student is assigned an academic supervisor from BHOS and an industrial mentor from the hosting company.* • *Students must maintain daily logs of activities.* • *A final report (approved and signed by the company supervisor) must be submitted to the BHOS academic supervisor within one week after completion.* *Students must present and defend their internship experience before the BHOS Internship Commission*
Reading list	*Before starting the internship:* • *Internship Notice and Program* • *Individual Task Sheet* • *Thematic Task assigned by BHOS Department* *After completion:* • *Daily Logbook* • *Final Internship Report*

Module designation	***MPA 202 - Pedagogical Internship***
Semester(s) in which the module is taught	*Year 2, Spring semester (Semester 4)*
Person responsible for the module	*Supervisors of Information Technology Department* *BHOS White City Building, Room 301* *99412 5210000 ext. 33030*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	*Mentored teaching practice, observation, class delivery, laboratory supervision, feedback discussions, report writing*
Workload (incl. contact hours, self-study hours)	*Total workload: 360 h = 360h extracurricular hours* ***Contact hours:*** *Examination preparation, consultation, self-study = 30 h/ week*
Credit points	*12 ECTS*
Required and recommended prerequisites for joining the module	• *Successful completion of prior theoretical and laboratory-based modules in the MSc curriculum* • *Completion of the Higher Education Pedagogy* • *Basic pedagogical knowledge or willingness to engage in reflective teaching practice*
Module objectives/intended learning outcomes	*Apply academic knowledge from cybersecurity courses in a teaching or mentoring environment, demonstrating the ability to plan and deliver effective learning sessions.* • *Develop teaching, communication, and mentoring skills by conducting seminars, laboratory demonstrations, and student consultations under faculty supervision.* • *Design instructional materials (lectures, labs, or tutorials) that integrate automation concepts with practical examples.* • *Assess and evaluate student performance, providing constructive feedback aligned with academic learning outcomes.* • *Demonstrate classroom management, professional ethics, and adherence to institutional teaching standards.* • *Reflect critically on teaching experiences and identify areas for professional growth.* • *Communicate technical topics clearly to diverse audiences, adjusting the level of complexity appropriately.*
Content	*Introduction to pedagogy in higher education* • *Lesson planning and learning-outcome mapping* • *Teaching observation and feedback cycles* • *Laboratory supervision and mentoring practices* • *Assessment design and evaluation strategies* • *Professional conduct and ethical behavior in academic settings* • *Reflective journaling and peer feedback* • *Final teaching demonstration and report submission*
Examination forms	*Report – 50%* *Supervisor evaluation – 30%* *Teaching demonstration – 20%*

Study and examination requirements	*Student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year. In the case of failure the student can also be given a chance to retake the exam. Resit Exam score (50%)+Before Exam score will remain the same (50%)*
Reading list	*1. L. S. Vygotsky, Mind in Society: The Development of Higher Psychological Processes, Harvard University Press, 1978.* *2. D. Kolb, Experiential Learning: Experience as the Source of Learning and Development, Pearson, 2015.* *3. James H. Stronge, Qualities of Effective Teachers, ASCD, 2018.* *4. John Biggs & Catherine Tang, Teaching for Quality Learning at University, Open University Press, 2011.*

Module designation	***MPA 204 - Master Thesis***
Semester(s) in which the module is taught	*Year 2, Spring semester (Semester 4)*
Person responsible for the module	*Supervisors of Information Technology Department* *BHOS Campus, office, 418* *99412 5210000 ext. 33238*
Language	*English*
Relation to curriculum	*Compulsory*
Teaching methods	• *Supervised individual or team project work* • *Weekly or bi-weekly progress meetings with supervisor* • *Independent research, design, and implementation* • *Lab sessions for hands-on development and testing* • *Peer review and self-assessment activities*
Workload (incl. contact hours, self-study hours)	*Total workload: 540h = 540h extracurricular hours* ***Contact hours:*** *Examination preparation, consultation, self-study = 45 h/ week*
Credit points	*18 ECTS*
Required and recommended prerequisites for joining the module	• *Satisfactory progress in the MSc programme* • *Completion of core master courses* • *Approval of project proposal by supervisor*
Module objectives/intended learning outcomes	• *Identify a significant and research-worthy problem and formulate a clear research question and objectives.* • *Conduct a comprehensive literature review, critically evaluating existing works and identifying gaps, challenges, and opportunities.* • *Apply suitable research methodologies (quantitative, qualitative, experimental, or hybrid) for collecting, analyzing, and interpreting data.* • *Design and implement experiments, models, or prototypes applying technical and analytical reasoning.* • *Demonstrate independent problem-solving skills, scientific integrity, and adherence to ethical standards in research.* • *Analyze results, interpret findings, and provide evidence-based conclusions supported by data, experiments, or simulations.* • *Write a well-structured academic thesis consistent with scientific and institutional formatting standards.* • *Defend research findings effectively during the oral examination, demonstrating professional communication skills and critical reflection.* • *Evaluate limitations, societal implications, and potential future directions of the conducted research.*
Content	• *Selection and approval of a research topic in modelling, control, estimation, sensing, communications, or information processing for multi-domain technical systems; obtain supervisor endorsement and confirm scope and success criteria.* • *Formulation of research questions, testable hypotheses, and measurable objectives tied to control, informatics, or system-integration problems; include performance metrics and validation criteria.*

	• *Comprehensive literature review and gap analysis focused on control theory, system identification, signal processing, embedded informatics; produce a synthesis that motivates novelty and feasibility.* • *Research design and methodology development selecting appropriate analytical, simulation, experimental, or data-driven methods; define modelling assumptions, uncertainty treatment, and evaluation metrics.* • *Data collection, experiment setup, or system implementation including sensor selection and calibration, real-time/embedded platform configuration, testbed or emulator deployment, and hardware–software integration procedures.* • *Statistical analysis, validation, and result interpretation using estimation theory, uncertainty quantification, sensitivity analysis and benchmarking against analytical models or reference implementations.* • *Thesis structure, documentation, and writing process that meets institutional standards and reproducibility practices: methods, results, code/data repositories, and appendices with algorithms or proofs.* • *Defense preparation, presentation, and response to examiners including demonstration of prototypes or recorded demos where applicable, clear exposition of methods and limitations, and discussion of implications for control and informatics practice.* • *Ethical conduct and academic integrity in research covering safety, data governance, human/organizational impact (if relevant), proper citation and plagiarism checks, and required institutional approvals.*
Examination forms	*Supervisor Review - 33%* *Final Technical Report/Turnitin - 33%* *Final Presentation and Defense – 34%*
Study and examination requirements	*Notes:* • *Students are required to submit progress reports at designated milestones.* • *The project topic must be approved by the faculty supervisor before implementation.* • *Collaboration with industry or research labs is encouraged for real-world exposure*
Reading list	*Teaching materials:* *Textbooks:* • *Depends on the scope of Project* *Software:* • *Depends on the scope of Project* *For class presentations and discussions, the student should utilize journal and internet materials. Moreover, the course does not limit the use of learning materials available at BHOS library.*