

Mastering Mechatronics at *Babol Noshirvani University of Technology*

Babol Noshirvani University of Technology is a top ranked technical university placed in north of Iran. BNUT is home to more than 6000 students and 200 faculty members in its green campus placed in Babol. Its amazing in-campus and out-campus and research facilities provides a calm environment for research and study.



BNUT stands in 1st place among all Iranian universities and also placed in 55th among the world young universities based on [Times Higher Education](#) ranking 2019.

Mechanical engineering and Electrical engineering faculties are among the most prestigious faculties in university with brilliant professors and great research facilities.

The cooperation between electrical and mechanical engineering faculties leads to development of Mechatronics in the campus.



Erasmus+

BNUT is a partner of FARmER project under the program of ERASMUS+ to develop the field

of Mechatronics in agricultural applications.

Due to engineering discipline of BNUT, the involved students from partner universities are welcomed to BNUT as visiting M.Sc. students for a one semester study in the field

of Mechatronics and the selected courses which will be delivered in English language. The student exchange program is a part of FARmER project and involved universities have pre-defined protocol to host the students.



Master Students Exchange

Study at BNUT as visiting student in Mechatronics

Partner Universities

ERASMUS+ project under ERASMUS+ program

- Technical University of Ilmenau
- Università degli Studi del L'Aquila
- Slovak University of Agriculture in Nitra
- Sari Agricultural Sciences and Natural Resources University
- Platov South-Russian State Polytechnic University
- Astrakhan State University
- Stavropol State Agrarian University
- South Ural State University
- Volgograd State Technical University



Cost of study and Accommodation

- The cost of study is 150 USD for each course.
- The study is free for the students from the universities which has a bilateral exchange contract with BNUT. You can ask the international office if there is a bilateral exchange contract with your university.
- For more information on accommodation cost, feel free to contact BNUT international office via: international@nit.ac.ir

Courses

The five following courses will be delivered in English for the spring semester 2020

- Advanced Robotics
- Advanced Control
- Renewable Energies
- Advanced Mechatronics
- Multi Input Multi Output Control

Course Credit Transfer

The student exchange is done based on European Credit Transfer and Accumulation System (ECTS) under ERASMUS+ program. The educational credit for the delivered courses is 6 ECTS credits. The result of courses will be officially reported to destination university international affairs office by BNUT.

Language and Calendar

The courses delivering and examinations language is English.
The semester begins Feb. 1st 2020 and finishes Jun. 25th 2020

How and When to Apply/VISA information

Students in partner universities can contact International office of their universities for apply in the courses. For more information of the visiting studentship and Iranian E-VISA apply, don't hesitate to contact international office of BNUT via: international@nit.ac.ir or nikzadfar@nit.ac.ir
The apply request should be sent no longer than Jan. 10th 2020



The following five courses are delivered in spring semester, starting from Feb. 2020,

Advanced Robotics

Module 1. Introduction to robots

Topic 1. The terminologies of robot arms

Topic 2. A brief discussion on robot design and components

Module 2. Robot kinematics

Topic 3. Rotational and translational coordination transformations

Topic 4. D-H parameters

Topic 5. Forward kinematics

Topic 6. Inverse kinematics

Module 3. Robot kinetics

Topic 7. Lagrangian dynamics analysis of robots

Topic 8. Forward kinetics

Topic 9. Inverse kinetics

Topic 10. Simulation of robot arms



Dr. Hamidreza Daniyali
Professor
Mechanical Engineering

Advanced Control

Module 1. State space representation of continuous dynamic systems

Topic 1. States and state space

Topic 2. Canonical forms of dynamic systems representation

Topic 3. Solving the state space equations using state transfer matrix

Topic 4. Presentation of system behavior using Eigenvalues and Eigenvectors

Module 2. Discrete dynamic systems

Topic 5. State space representation of dynamic discrete systems

Topic 6. Conversion of continuous system representation to discrete representation

Topic 7. Z transformation and pulse transfer function

Module 3. Stability

Topic 8. Definitions of stability

Topic 9. Positive definite functions and Lyapunov theorem

Module 4. Controllability of observability

Topic 10. Definition of controllability and observability in continuous and discrete systems

Topic 11. Controllability and observability matrices and relative tests

Module 5. State vector feedback control

Topic 12. Eigenvalue manipulation using state feedback

Module 6. State observers

Topic 13. Open loop observers and Luenberger observers

Topic 14. Reduced order observer design

Topic 15. Separation rule and design of feedback controller

Module 7. Linear Quadratic Regulators

Topic 16. Definition and Design of LQR controllers

Topic 17. Riccati equations solving



Dr. Alireza Fathi
Associate Professor
Mechanical Engineering

Renewable Energies

- National and regional energy issues.
- Understanding of existing versus alternative energy development
- Knowledge of regulatory tools and issues that professionals need for jobs in policy and planning, management and consulting.
- Developing the analytical skills needed for problem solving and interpretation of technical, regulatory and policy concepts involving renewable energy generation.



Dr. Mostafa Rahimnejhad
Associate Professor
Chemical Engineering

Multi Input Multi Output Control

Module 1. Representation of linear MIMO systems

Topic 1. Matrix description of systems

Topic 2. Matrix fraction description of systems

Module 2. Poles and zeros in MIMO systems

Topic 3. Poles of MIMO systems

Topic 4. Zeros of MIMO systems

Topic 5. Transmission zeros placement

Module 3. Analysis and design of MIMO control systems in state space

Topic 6. Observability and controllability of linear systems

Topic 7. Output controllability and functional controllability

Topic 8. Decoupling of MIMO systems using output feedback

Module 4. Stability and performance in MIMO control systems

Topic 9. Nominal stability analysis in MIMO systems

Topic 10. Performance in MIMO control systems

Module 5. Classic problems in MIMO systems

Topic 11. Input-output selection in MIMO systems

Topic 12. System configuration

Module 6. PI control of MIMO systems

Module 7. Design of MIMO control systems using QFT



Dr. Kamyar Nikzadfar
Assistant Professor
Mechanical Engineering

Advanced Mechatronics

Module 1. Introduction to mechatronics

Topic 1. The mechatronic design philosophy and V-type system design

Topic 2. Mechatronic systems components and modules

Module 2. Model based design technique

Topic 3. Multidisciplinary systems modeling

Topic 4. System Identification

Topic 5. Digital controller design

Module 3. Mechatronics systems implementation

Topic 6. Sensors and signal conditioning

Topic 7. Actuators and driver circuits

Topic 8. Digital processors and logic implementation



Dr. Kamyar Nikzadfar
Assistant Professor
Mechanical Engineering