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| https://admin.antalya.edu.tr/files/139/abu-logo-en.jpg | **ECTS Course Description Form** |
| **PART I ( Senate Approval)** |
| **Offering School**  | **Antalya Bilim University** |
| **Offering Department** | **Industrial Engineering** |
| **Program(s) Offered to** | **Industrial Engineering** | **Elective** |
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| **Course Code**  | **IE-350** |
| **Course Name** | **Industrial Nanotechnology** |
| **Language of Instruction** | **English** |
| **Type of Course** | *Lecture* |
| **Level of Course** | **Undergraduate** |
| **Hours per Week** | **Lecture: 3** | **Laboratory:** | **Recitation:**  | **Practical:**  | **Studio:** | **Other:** |
| **ECTS Credit** | **6** |
| **Grading Mode** | **-** |
| **Pre-requisites** | **-** |
| **Co-requisites** | **-** |
| **Registration Restriction** | *-* |
| **Educational Objective** | * To elucidate on advantages of nanotechnology based applications in each industry
* To provide instances of contemporary industrial applications of nanotechnology
* To provide an overview of future technological advancements and increasing role of

nanotechnology in each industry |
| **Course Description** | The IE-350 covers the recent improvements on nanotechnology in different industry areas |
| **Learning Outcomes**  | **LO1** | will be able to describe the new trends of nanotechnology in* Electric-electronics industry
* Pharmaceutical and biomedical industry
* Chemical industry
* Agricultural and food industry
* Textile and cosmetics industry
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| **LO2** |
| **LO3** |
| **LO4** |
| **LO5** |
|  |
| **PART II ( Faculty Board Approval)** |
| **Basic Outcomes (University-wide)** | **No.** | **Program Outcomes** | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** |  |
| **PO1** | Ability to communicate effectively and write and present a report in Turkish and English.  | 🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸🗸 🗸 🗸 🗸 🗸 |
| **PO2** | Ability to work individually, and in intra-disciplinary and multi-disciplinary teams. |
| **PO3** | Recognition of the need for life-long learning and ability to access information , follow developments in science and technology, and continually reinvent oneself. |
| **PO4** | Knowledge of project management, risk management, innovation and change management, entrepreneurship, and sustainable development. |
| **PO5** | Awareness of sectors and ability to prepare a business plan. |
| **PO6** | Understanding of professional and ethical responsibility and demonstrating ethical behavior. |
| **Faculty Specific Outcomes** | **PO7** | Ability to develop, select and use modern techniques and tools necessary for engineering applications and ability to use information technologies effectively. |
| **PO8** | Recognition of the effects of engineering applications on health, environment and safety in the universal and societal dimensions and the problems of the time and awareness of the legal consequences of engineering solutions. |
| **PO9** | Ability to identify, define, formulate and solve complex engineering problems; and electing and applying appropriate analysis and modeling methods for this purpose. |
| **Discipline Specific Outcomes (program)** | **PO10** | Sufficient knowledge in mathematics, science and civil engineering; and the ability to apply theoretical and practical knowledge in these areas to model and solve engineering problems. |
| **PO11** | Ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions of economic, environmental, sustainability, manufacturability, ethics, health, safety, social and political issues; and the ability to apply modern design methods for this purpose. |
| **PO12** | Ability to design experiments, conduct experiments, collect data, analyze and interpret results for the examination of industrial engineering problems. |
| **Specialization Specific Outcomes** | **PO N….** |  |
| **PART III ( Department Board Approval)** |
| **Course Subjects, Contribution of Course Subjects to Learning Outcomes, and Methods for Assessing Learning of Course Subjects** | **Subjects** | **Week** |  | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** |  |
| **S1** | 1-2 | **NANOTECHNOLOGY IN ELECTRICAL AND ELECTRONICS INDUSTRY** Advantages of nano electrical and electronic devices –Integrated Circuits – Lasers - Micro and NanoElectromechanical systems – Sensors, Actuators,–Diodes and Nano-wire Transistors - Organic electroluminescent displays – Quantum optical devices – Batteries - Fuel cells- Photo-voltaic cells  | A1-A2 | A1-A2 | A1-A2 | A1-A2 | A1-A2 |  |
| **S2** | 3-4 | **NANOTECHNOLOGY IN BIOMEDICAL AND PHARMACEUTICAL INDUSTRY** Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis -Nanorobotics in Surgery – Photodynamic Therapy - Nanosensors in Diagnosis– Neuro-electronic Interfaces– Drug delivery – Therapeutic applications | A1-A2 | A1-A2 | A1-A2 | A1-A2 | A1-A2 |  |
| **S3** | 5-6 | **NANOTECHNOLOGY IN CHEMICAL INDUSTRY** Nanocatalyts – Smart materials – Heterogenous nanostructures and composites – TiO2 Nanoparticles for water purification- Photocatalytic mechanism, general pathways and kinetics- Treatment of Arsenic- Removal of Heavy metal ions by Iron and polymeric based nanoparticles- Magnetic Nanoparticles Nanoscale carbon for contaminant separation -Nanostructures for Molecular recognition, Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors | A1-A2A1-A2 | A1-A2A1-A2 | A1-A2A1-A2 | A1-A2A1-A2 | A1-A2A1-A2 |  |
|  | 7 | **MIDTERM-I** |  |  |  |  |  |  |
| **S4** | 8 | **NANOTECHNOLOGY IN AGRICULTURE AND FOOD TECHNOLOGY** Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology –Potential of nano-fertilizers – Nanotechnology in Food industry - Packaging, Food processing - Food safety and biosecurity – Contaminant detection – Smart packaging | A1-A2 | A1-A2 | A1-A2 | A1-A2 | A1-A2 |  |
| **S5** | 9-10 | **NANOTECHNOLOGY IN TEXTILES AND COSMETICS (** **Nanofibre production** - Electrospinning – Controlling morphologies of nanofibers- Tissue engineering application – Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers -Bionics– Swim-suits with shark-skin-effect,Soil repellence, Lotus effect - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes)  **Cosmetics** – Formulation of Gels, Shampoos, Hair-conditioners (Micellar selfassembly and its manipulation) –Sun-screen dispersions for UV protection using Titanium oxide – Color cosmetics | A1-A2A1-A2 | A1-A2A1-A2 | A1-A2A1-A2 | A1-A2A1-A2 | A1-A2A1-A2 |  |
| **Assessment Methods, Weight in Course Grade, Implementation and Make-Up Rules**  | **No.** | **Type** | **Weight** | **Implementation Rule** | **Make-Up Rule** |
| **A1** | **Exam** | *70 %* | No electronic devices are allowed in the examinations except for calculators. | If a student misses an exam and provides an acceptable legitimate document, a make-up exam should be provided for at least one midterm. |
| **A2** | **Homework** | *30 %* | The duration is one week. Assignments are announced to the students at least one week in advance. |  |
| **A3** | **Quiz** |  |  |  |
| **A4** | **Project** |  |  |  |
| **A5** | **Report** |  | - | - |
| **A6** | **Presentation** |  | - | - |
| **A7** | **Attendance/ Interaction** |  | - | - |
| **A8** | **Class/Lab./****Field Work** |  | - | - |
| **A9** | **Other** |  |  |  |
| **TOTAL** | **100%** |
| **Evidence of Achievement of Learning Outcomes** | Every topic is tested with at least one exam question. In order to pass, a student needs to accumulate certain percentage of points and this percentage is determined by the class mean. |
| **Method for Determining Letter Grade** | The method on which the letter grade is based on will be announced at the beginning of the semester, and this method may be subjected to change depending on the performance of the students.

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| Assessment | Midterm 1 | Final | Homework | TOTAL |
| Points | 30 | 40 | 30 | 100 |

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| Total points | 100 - 95 | 94-90 | 89-85 | 84-80 | 79-75 | 74-70 | 69-65 | 64-60 | 59-55 | 54-45 |
| Letter Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D |

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| **Teaching Methods, Student Work Load** | **No** | **Method** | **Explanation** | **Hours** |
| ***Time applied by instructor*** |
| **1** | **Lecture** |  | 3x14=42 |
| **2** | **Interactive Lecture** |  |  |
| **3** | **Recitation** |  |  |
| **4** | **Laboratory** |  |  |
| **5** | **Practical** |  |  |
| **6** | **Field Work** |  |  |
| ***Time expected to be allocated by student*** |
| **7** | **Project** |  |  |
| **8** | **Homework** |  | 20 |
| **9** | **Pre-class Learning of Course Material**  |  | 40 |
| **10** | **Review of Course Material** |  | 50 |
| **11** | **Studio** |  |  |
| **12** | **Office Hour** |  |  |
| **TOTAL** |  |
| **IV. PART** |
| **Instructor** | **Name** | Assist. Prof. Seda Demirel Topel |
| **E-mail** | Seda.demireltopel@antalya.edu.tr |
| **Phone Number** | 5346193811 |
| **Office Number** | A1-62 |
| **Office Hours** | It will be announced during the term |
| **Course Materials** | **Mandatory** |  |
| **Recommended** |  Bharat Bhushan, “*Handbook of Nanotechnology”*, Springer, 2010. |
| **Other** | **Scholastic Honesty** |  |
| **Students with Disabilities** |  |
| **Safety Issues**  |  |
| **Flexibility** |  |