Course guide
240624 - 240624 - The History of Applied Mathematics in Engineering

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023 **ECTS Credits:** 3.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Mª Rosa Massa Esteve

Others: Mª Rosa Massa Esteve

PRIOR SKILLS

Students with the knowledge of mathematics of first course could follow easily the course.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
1. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
3. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

Exposition of teacher. Use of Atenea. Cooperative work. Presentation of students. Personal work of student. Study of significant texts, using originals sources and practical work in the classroom.

LEARNING OBJECTIVES OF THE SUBJECT

The history of sciences gives a dynamic and humanist view that contribute to the integral formation of students and besides complement the thematic study of the textbooks. The course complements the scientific formation of students, analysing the treats more relevant in the history on the relationship between mathematics and engineering.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	40.00
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

Tema 1. Mathematics and engineering in the Antiquity

Description:
The origins of mathematics and technology:The cuneiform tablets of Babylon and the papyrus of Egypt. Greek science: Elements of Euclid. Mathematics and astronomy at Aristarchus of Samos. Arquimedes mathematic and engineer. The first texts on engineery.

Full-or-part-time: 10h
Theory classes: 4h
Self study : 6h

Tema 2. Engineers-Artists in the Renaissance

Description:
The beginnings of algebra. Mohamed Ben Musa Al-khwarizmi (850 AD). Calculation and merchandise in medieval mathematics. Geometry and art. Leon Battista Alberti (1404-1472). First trigonometric developments. The engineers of the Renaissance. The Nova Scientia (1537) by Niccolo Tartaglia. Leonardo da Vinci, artist-engineer. Scientific instruments and mathematics. The resolution of the third and fourth degree polynomial equations. Girolamo Cardano (1501-1576) and engineer Rafael Bombelli (1526-1572).

Full-or-part-time: 20h
Theory classes: 8h
Self study : 12h

Tema 3. The algebrization of mathematics. Scientific Revolution

Description:
François Viète (1540-1603) and the Analytic Art. The algebralization of mathematics. Analytical Geometry. René Descartes (1596-1650). The Principia of Isaac Newton. The infinitesimal calculus of Newton and Leibniz, applied mathematics in engineering.

Full-or-part-time: 15h
Theory classes: 6h 20m
Self study : 8h 40m

Tema 4. Applied Mathematics and engineering in the Ilustration

Description:
The works of Leonhard Euler, mathematic and engineer of the eighteenth century: Mechanics of the science of motion 2 volumes (1736). The Encyclopedie and the Ilustration. D'Alembert and the applied mathematics.

Full-or-part-time: 20h
Theory classes: 10h
Self study : 10h

Tema 5. Mathematical courses for enginyers, mixed mathematics. The Royal Militar Academy of Mathematics in Barcelona (1720)

Description:
The origen of the engineering in Catalogne. The relations and contents of the mathematical courses for engineers of eighteenth century in France, Spain and Portugal: Belidor, Lucuce and Pimentel.

Full-or-part-time: 10h
Theory classes: 4h
Self study : 6h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:
- Kranzberg, Melvin ; Carroll W. Pursell [eds.]. Historia de la Teconologia: La Técnica en Occidente de la Prehistoria a 1900. Barcelona: Gustavo Gili, 1981. ISBN 8425210224.
- López Piñero, José Maria. Ciencia y Técnica en la sociedad española de los siglos XVI y XVII. Barcelona: Labor, 1979. ISBN 8433517236.
- Rommevaux, Sabine; Spiesser, Maryvonne; Massa Esteve, M. Rosa. Pluralité de l'algèbre à la Renaissance. Paris: Honoré Champion, 2012. ISBN 9782745323989.
- Serres, Michel; Bensaude-Vincent, Bernadette. Historia de las ciencias. 2a ed. Madrid: Cátedra, cop. 1998. ISBN 84-376-0988-7.
- Bedel, Ch. Enseignement et diffusion des sciences en France au dix-huitième siècle. Paris: Hermann, 1986. ISBN 2 7056 5990 0.
- Capel Sáez, Horacio; Sánchez, Joan-Eugeni; Moncada, Omar. De Palas a Minerva : la formación científica y la estructura institucional de los ingenieros militares en el siglo XVIII. Barcelona : Madrid: Serval ; CSIC, 1988. ISBN 8400068297.
- Dear, Peter. Discipline & Experience: The Mathematical Way in the Scientific Revolution [on line]. Chicago: University of Chicago, 1995 [Consultation: 13/10/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=660538. ISBN 1283058162.