Course title	**Pharmaceutical Technology with Biopharmaceutical Elements**				
Course Code	**PHRM223**				
Course Type	**Theoretical and Laboratory**				
Level	**Diploma**				
Year / Semester	**2nd Year / 4th Semester**				
Teacher's Name	**Georgiou Cynthia**				
ECTS	8	**Lectures / week**	3	**Laboratories / week**	1
Course Purpose and Objectives	The aim of the course is to introduce students to the principles of pharmaceutical technology, the various types of pharmaceutical formulations used in the pharmaceutical industry and practice. Students will learn and understand the basic preparation and characterization methods applied to the various types of dosage forms they may encounter during their careers as Medical Representatives. In addition, the course aims to provide students with basic medical and scientific knowledge on the various principles of Biopharmaceuticals and Pharmacokinetics.				
Learning Outcomes	Upon completion of the course, students are expected to: **Knowledge** 1. **Categorise**, **understand,** and **describe** the different pharmaceutical formulations. 2. **Understand** the correct application of dosage forms. 3. **Categorise** the formulations according to their route of administration. 4. **Recognize** the correct terminology and abbreviations of drugs 5. **Describe** the latest technologies applied in laboratories and the pharmaceutical industry. 6. **Explain** the importance and role of biopharmaceuticals and pharmacokinetics in the therapeutic effect. 7. **Formulate** the concept of bioavailability and apply it to calculations. **Skills** 8. **Analyse** the advantages and disadvantages of various pharmaceutical formulations. 9. **Distinguish** and **report** the main parameters involved in the absorption, distribution, metabolism, and excretion of drugs. 10. **Apply** mathematics to calculate the volume of distribution and drug bioavailability. **Competences** 11. Be able to **form** an effective relationship with the healthcare professional in relation to the drug they represent and to **familiarize** themselves with the basic theory underlying the bioequivalence studies of generic medicinal products.				
Prerequisites	-	**Required:**	-		
Course Content	• Definition and object of pharmaceutical technology, stages of drug development. Pharmaceutical material, pharmaceutical dosage form, pharmaceutical formulations. Classification of dosage forms. Active Pharmaceutical Ingredients (APIs) and excipients used in the manufacture of dosage forms.				

	• Solubilization, absorption, protein binding, metabolism, drug excretion. Pharmacokinetic models – Introduction – General. The one- and two-compartment model. • Biopharmaceutical aspects of formulations. Amorphous-crystalline drugs and their solubility. Relative and absolute bioavailability- Bioequivalence of generics. Biopharmaceutical Classification System (BCS) of drugs. Importance of drug concentration in the pharmaceutical formulation. • Pre-formulation and formulation stages in the design of dosage forms. Application of factorial design and artificial neural networks. Research, development, and production. Patents in the pharmaceutical industry. Brand name drugs and generics. Basic apparatus used in Pharmaceutical Industry. • Solid dosage forms. Basic Properties of solid dosage forms. Constituents, formulation, properties, filling of capsules-oral powders. • Tablets: types, excipients, applications. Methods for the development of controlled release oral solid dosage forms. • Semisolid dosage forms: creams, ointments, gels for both pharmaceutical and cosmetic use and their characteristics. • Suspensions and Emulsions. Preparation, application of emulsifying agents, oil-in-water, water-in-oil and modified emulsions. • Liquid dosage forms: Syrups -Elixirs- mouthwashes and natural plants extracts. Oral Solutions and Auxiliary substances. Production of pharmaceutical solutions. • Pharmaceutical preparations for the respiratory system (by inhalation), liquids-solutions (by nebulization), solids-fine powders (by special applicators). • Transdermal drug delivery systems, properties, and enhancement of transdermal absorption. • Otic and nasal formulations. Production methods and applications. • Rectal and vaginal formulations. Production methods and applications. • Sterile dosage forms. Antimicrobial substances and preservatives. • Sterilization of pharmaceutical products. Ophthalmic and Injectable products as well as their properties and uses. • Distribution systems of new drugs for topical, cerebral, nasal and transdermal administration (wound dressings, *in situ* gels, nanotechnology-based preparations, etc.). • **<u>Laboratory Exercises:</u>**

	1] Preparation of various drug concentrations oral solutions 2] Manufacture of oral powders 3] Suppository production and tablet filling 4] Manufacture of gels based on natural plant extracts (i.e. Green tea) and measurement of dispersibility 5] Preparation of emulsions w/o and o/w, i.e. with cinnamon and ascorbic acid, respectively 6] Preparation of syrup and mouthwashes 7] Alginate gel pellets configuration for essential oil trapping
Teaching Methodology	The course content will be taught through: Power Point presentations, guided discussions with the active participation of students, individual and team work by students and the use of a variety of audiovisual media and other teaching tools as required for the delivery of each module. The lectures are accompanied by various laboratory exercises, carried out in the Pharmaceutical Technology of the College.
Bibliography	***Greek Bibliography*** • Perrie, Y. (2016), *Φαρμακευτική τεχνολογία: Μεταφορά και στοχευμένη δράση φαρμάκων*, Παρισιάνου Α.Ε., ISBN 978-960-583-091-5. • Μπαλτζίδης, Αναστάσιος (2012), Στοιχεία Φαρμακευτικής Τεχνολογίας, KES COLLEGE. • Παπαιωάννου Γ. Θ. (2007), *Φαρμακευτική Τεχνολογία Ι*, Επιστημονικές εκδόσεις Παρισιανού Α.Ε., ISBN: 9789603944874. • Aulton, M. E., Taylor, K. M.G. (2019). Aulton Φαρμακευτική Τεχνολογία: Σχεδιασμός και Παρασκευή Φαρμάκων. Επιστημονικές Εκδόσεις Παρισιάνου Α.Ε. 4η Έκδοση. ISBN: 978-960-583-216-2 • Βιζιριανάκης, Ιωάννης Σ. (2016) *Κλινική Φαρμακοκινητική: βασικές αρχές της φαρμακευτικής αγωγής στην κλινική πράξη*, Σταύρος Αντ. Σαρτίνας, ISBN: 978-618-5161-29-3. ***English Bibliography*** • Rowe, Raymond C., Sheskey, Paul J. and Owen, Siân C (2006) *Handbook of Pharmaceutical Excipients*. Pharmaceutical Press, ISBN:978-158212058 • Bertone, S., Rossi, M. (2013). *Drug Development: Principles, Methodology and Emerging Challenges*. New York : Nova Science Publishers, Inc. ISBN: 9781624177903. **EBSCOHost** • Macheras, P. (2006). *Modeling in Biopharmaceutics, Pharmacokinetics and Pharmacodynamics: Homogeneous and Heterogeneous Approaches (Interdisciplinary Applied Mathematics)*, Springer, New York, ISBN : 0387281789 • Jacobs, Terry (2005) *Good Design Practices for GMP Pharmaceutical Facilities (Drugs and the Pharmaceutical Sciences S.*), Taylor and Francis, ISBN:0824754638 • Wiffen, P., Mitchell, M., Snelling, M., Stoner, N. (2017). *Oxford handbook of Clinical Pharmacy*, 3rd Edition, OUP Oxford, ISBN: 978-0198735823.
assessment	• Attendance and participation: 10% • Assignment: 10% • Laboratory Exercises 10% • Midterm Written Examination: 20% • Final Written Examination: 50%

	Final written examination has two parts that are sat on the same day. The first part includes closed-ended questions, such as multiple choice questions, true or false, matching exercises, complete the gaps exercises, etc. The first part is usually worth 40% - 60% of the total marks of the exam paper. The second part includes open-ended questions that are meant to assess the students' abilities to analyse, reflect, explain, recall etc. The second part is usually worth 60% - 40%. The total marks of the exam paper are 100.
Language	Greek or English