

Subject Description Form

Subject Code	BME31114
Subject Title	Biomedical Instrumentation and Sensors
Credit Value	3
Level	3
Prerequisite	BME31121 Fundamentals of Biomedical Instrumentation II
Objectives	This subject aims to provide students with fundamental concepts of biomedical instrumentation and to develop students' ability to analyze the signals and solve problems. It also aims to explain the principles of and ways in which to build the instrumentation, including different kinds of sensors.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: <ol style="list-style-type: none">Describe and explain the principles of various biomedical devices and sensors;Describe and design the instrumentation for amplifying the bioelectrical signals;Demonstrate an ability to use appropriately and safely the techniques, sensors, and selected modern engineering tools necessary for bioengineering practice.
Contribution to Programme Outcomes (Refer to Part I Section 10)	<ul style="list-style-type: none">▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach and Practice)▪ Programme Outcome 3: Demonstrate an ability to design a system, component, or process relevant to BME to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability. (Teach and Practice)▪ Programme Outcome 7: Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for BME practice. (Teach and Practice)▪ Programme Outcome 8: Demonstrate an ability to use the computer/IT tools relevant to the BME discipline along with an understanding of their processes and limitations. (Teach and Practice)▪ Programme Outcome 9: Demonstrate an ability to function in multi-disciplinary teams. (Practice)▪ Programme Outcome 11: Demonstrate an ability to communicate

	effectively and advise clients, professional colleagues, and other members of the community. (Practice)																																																																				
Subject Synopsis/ Indicative Syllabus	<p>Handle various types of equipment used in health care; principles of the design of amplifier for measuring bioelectrical signals; various biomedical devices; design building block for the bioinstrumentation device; and related safety issues.</p> <p>Handle the measurements of force transducer, blood flow, displacement, temperature, respiratory equipment; therapeutic and prosthetic devices.</p>																																																																				
Teaching and Learning Methodology	Students will learn in lectures the principles of various components used in different biomedical instrumentation and sensors. Students will write a report on how to solve a practical healthcare problem using latest technologies in bioinstrumentation and sensors. Students will learn additional example problems in laboratory sessions to facilitate students learning. Students will also practice real examples of bioinstrumentation and sensors in laboratory.																																																																				
Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="8">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr><tr><th>a</th><th>b</th><th>c</th><th></th><th></th><th></th><th></th><th></th></tr><tr><td>Assignments</td><td>20%</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Lab and topic review reports</td><td>30%</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Lab performance</td><td>10%</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Final examination</td><td>40%</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Total</td><td>100%</td><td colspan="8"></td></tr></table> <p>Note: To pass this subject, students must obtain grade D or above in both continuous assessment and final examination.</p> <p><i>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</i></p> <p>All the continuous assessment and final examination will be designed to assess the 3 outcomes.</p>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)								a	b	c						Assignments	20%	√	√	√						Lab and topic review reports	30%	√	√	√						Lab performance	10%	√	√	√						Final examination	40%	√	√	√						Total	100%								
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Student Study Effort Expected	Class contact:	
	▪ Lectures	30 Hrs.
	▪ Labs	9 Hrs.
	Other student study effort:	
	▪ Self-study	59 Hrs.
	▪ Lab reports and assignments	28 Hrs.
	Total student study effort	126 Hrs.
Reading List and References	<ul style="list-style-type: none"> ▪ Webster JG (Editor). Medical Instrumentation Application and Design, 4th/3rd ed., John Wiley & Sons, 2010/1998. ▪ Webster JG (Editor), Bioinstrumentation, John Wiley & Sons, 2004. ▪ Chrste BL. Introduction to Biomedical Instrumentation: The Technology of Patient Care, Cambridge University Press, 2009. ▪ Chatterjee S. Biomedical Instrumentation Systems, Delmar Cengage Learning, 2010. ▪ Carr JJ and Brown JM. Introduction to Biomedical Equipment Technology, 4th ed., Prentice Hall, 2001. ▪ Akay M (Editor), Wiley Encyclopedia of Biomedical Engineering, Wiley, 2006. ▪ Harsanyi G. Sensors in Biomedical Applications: Fundamentals, Technology and Applications, Technomic Publishing Co., 2000. 	
Date of Last Major Revision	14 July 2014	
Date of Last Minor Revision	25 August 2015	