Program Specification

College: Biomedical Engineering
Curriculum: Bachelor of Engineering Program in Biomedical Engineering, **2025**

Section 1: General Information

Course Code & Title	BME101: Introduction to Biomedical Engineering **1(0-3-2)**
Corequisite	-
Prerequisite	-
Semester	S/2025
Section	121
Course Type	☐ Foundational Course ☐ General Education Course ■ Specialized Course ☐ Free Elective
Instructors Assoc. Prof. Nuntachai Thongpan Asst. Prof. Dr. Pichit Boonkrong Assoc. Prof. Dr. Nuttapol Tanadchangsaeng Mr. Rawiphon Chotikunnan Mr. Anuchan Panaksri	 ■ Instructor, ☐ Special Lecturer ■ Instructor, ☐ Special Lecturer ■ Instructor, ☐ Special Lecturer ■ Instructor, ☐ Special Lecturer ■ Instructor, ☐ Special Lecturer
Classroom	■ On-campus (6-301A) , ☐ Off-campus

Section 2: Course Objectives and Components

1. Course Objectives

1.1 To enable students to learn and understand the history and background of biomedical engineering and its various specialized fields.

1.2 To learn and develop students' attitudes and sense of responsibility to prepare them for professional biomedical engineering studies at Rangsit University.

1.3 To provide students with real-world experience by observing and collecting data regarding biomedical engineering laboratories, including processes, procedures, and methods of applying biomedical engineering knowledge in practice; and to reflect on and discuss observations with peers and instructors to formulate a conceptual framework of the profession based on their discoveries.

1.4 To develop knowledge, skills, and learning development methods, self-improvement, and lifelong learning skills and approaches through contemporary methods utilizing 21st-century technology to prepare students for theoretical, practical, and applied learning at Rangsit University and for future professional practice.

2. Course Description

The history and development of biomedical engineering; an introduction to the interdisciplinary nature of biomedical engineering and its applications; principles of biomechanics, biomaterials, cellular and tissue engineering; artificial organs; biomedical devices; rehabilitation engineering; biomedical and health informatics innovations; clinical engineering; foundational knowledge and skills regarding tools for computer modeling and animation necessary for solving biomedical engineering problems; as well as ethics, morality, and professional conduct in the biomedical engineering profession.

3. Weekly Consultation Hours and Contact Information

Students may consult with instructors for 2 hours per week.

Email: nuntachai.t@rsu.ac.th Facebook: –
Line: – Others: specify…

4. Course Learning Outcomes (CLOs)

- CLO 1: Demonstrate knowledge regarding the history, background, significance, key principles, ecosystem, constraints, safety and hazard prevention, and components of various branches of biomedical engineering.

- CLO 2: Explain the application of relevant knowledge in various areas to guide the study and development of technologies and tools for human healthcare.

- CLO 3: Associate the role of engineering in medical diagnosis, treatment, and rehabilitation.

- CLO 4: Describe the relationship between biomolecular principles and biomaterials, tissue engineering, and biomechanics.

- CLO 5: Develop and create simple computer animations to illustrate an overview of biomedical engineering.

- CLO 6: Demonstrate discipline, punctuality, and responsibility to oneself and society.

- CLO 7: Exhibit leadership, curiosity, a positive work attitude, empathy, selflessness, and a public-minded spirit; able to collaborate with others, accept and understand individual differences, and respect human rights and dignity.

Section 3: Development of Student Learning Outcomes

1. Knowledge

PLOs	CLOs	Teaching Methods	Assessment Methods
2.1.1	Demonstrate knowledge regarding the history, background, significance, key principles, ecosystem, constraints, safety and	1. Lecture 2. Laboratory demonstration 3. Project-based learning	1. Evaluation of assigned tasks 2. Evaluation of project work, presentations, and reports

	hazard prevention, and components of various branches of biomedical engineering.	4. Meetings for task assignment and follow-up	
2.1.2	Associate the role of engineering in medical diagnosis, treatment, and rehabilitation.	1. Lecture 2. Laboratory demonstration 3. Project-based learning 4. Meetings for task assignment and follow-up	1. Evaluation of assigned tasks 2. Evaluation of project work, presentations, and reports
2.1.3	Describe the relationship between biomolecular principles and biomaterials, tissue engineering, and biomechanics.	1. Lecture 2. Laboratory demonstration 3. Project-based learning 4. Meetings for task assignment and follow-up	1. Evaluation of assigned tasks 2. Evaluation of project work, presentations, and reports

2. Skills

PLOs	CLOs	Teaching Methods	Assessment Methods
2.2.1	Explain the application of relevant knowledge in various areas to guide the study and development of technologies and tools for human healthcare.	1. Lecture 2. Laboratory demonstration 3. Project-based learning 4. Meetings for task assignment and follow-up	1. Evaluation of assigned tasks 2. Evaluation of project work, presentations, and reports
2.2.2	Develop and create simple computer animations to illustrate an overview of biomedical engineering.	1. Lecture 2. Laboratory demonstration 3. Project-based learning 4. Meetings for task assignment and follow-up	1. Evaluation of assigned tasks 2. Evaluation of project work, presentations, and reports

3. Ethics

PLOs	CLOs	Teaching Methods	Assessment Methods
3.1.1	Demonstrate discipline, punctuality, and responsibility to oneself and society.	1. Integrate content on discipline and responsibility 2. Integrate ethics discussions during project work 3. Emphasize honesty,	1. Observation of timely submission 2. Evaluation of assigned tasks 3. Evaluation of project work, presentations, and reports

		teamwork, humility, and compassion	

4. Personal Attributes

PLOs	CLOs	Teaching Methods	Assessment Methods
4.2.1	Exhibit leadership, curiosity, a positive work attitude, empathy, selflessness, and a public-minded spirit; able to collaborate with others, accept and understand individual differences, and respect human rights and dignity.	1. Project-based team assignments 2. Meetings for task assignment and follow-up	1. Observation of behavior and assignment performance 2. Evaluation of project work, presentations, and reports

Section 4: Teaching Plan and Assessment

1. Teaching Plan

Weeks	Topic/Details	Activities/Materials	Hours	Instructors
1 10/06/68	History, Development, and Overview of Biomedical Engineering and Biomedical Engineering at Rangsit University	Lectures on the history, development, and overview of the various fields of biomedical engineering	6	Assoc. Prof. Nuntachai Thongpan;
2-3 17/06/68 24/06/68	Various Fields of Biomedical Engineering	Students divided into subgroups to engage in hands-on activities in various biomedical engineering research labs: 1. Medical Electronics, 2. 2. Signal/Image Processing, and Neuro Systems Engineering 3. Medical Robotics 4. Medical Informatics and Intelligent Systems 5. Rehabilitation Engineering 6. Biomedical Materials and Tissue Engineering 7. Clinical Engineering 8. Medical Devices and Medical Imaging	12	Assoc. Prof. Nuntachai Thongpan; Asst. Prof. Pichit Boonkrong; Assoc. Prof. Nuttapol Tanadchangsaeng; Mr. Rawiphon Chotikunnan; Mr. Anuchan Panaksri
4 1/07/68	1. Ability to learn how to learn and to seek knowledge using	1. Deliver a lecture on learning how to learn and acquiring knowledge	6	Assoc. Prof. Nuntachai Thongpan; Asst. Prof. Pichit Boonkrong;

	contemporary methods and technologies. 2. Ability to reflect on learned concepts and engage in discussions with peers and instructors.	through contemporary methods and technologies. 2. Have students present key insights, engage in reflective discussions with peers and the instructor, and summarize, review, and suggest appropriate learning approaches.		Assoc. Prof. Nuttapol Tanadchangsaeng; Mr. Rawiphon Chotikunnan; Mr. Anuchan Panaksri; Special Lecturer
5-7 8/07/68 15/07/68 22/07/68	Creation of Computer Animation in Biomedical Engineering	Students engage in hands-on creation of computer animations related to the conceptual framework of the profession, practitioner roles, and future career pathways	18	Mr. Rawiphon Chotikunnan; Mr. Anuchan Panaksri
8 29/7/68	1. Reflection and Discussion Based on Learning 2. Presentation of Findings through In-class and Written Reports and Computer Animation	Students present the definition of biomedical engineering, research development approaches, and future career interests using computer animation, summarizing findings such as the conceptual framework of the profession and practitioner roles	6	Assoc. Prof. Nuntachai Thongpan; Asst. Prof. Pichit Boonkrong; Assoc. Prof. Nuttapol Tanadchangsaeng; Mr. Rawiphon Chotikunnan; Mr. Anuchan Panaksri
Total			**45**	

2. Assessment Plan

Course Learning Outcomes	Assessment Methods	Assessment Week	Weight (%)
CLO 1: Demonstrate knowledge regarding the history, background, significance, key principles, ecosystem, constraints, safety and hazard prevention, and components of various branches of biomedical engineering.	1. Evaluation of project results based on related animation content 2. Evaluation of project report based on related content	Week 8	30%
CLO 2: Explain the application of relevant knowledge in various areas to guide the study and development of technologies and tools for human healthcare.	1. Evaluation of project results based on related animation content 2. Evaluation of project report based on related content	Week 8	10%
CLO 3: Associate the role of engineering in medical diagnosis, treatment, and rehabilitation.	1. Evaluation of project results based on related animation content 2. Evaluation of project	Week 8	10%

	report based on related content		
CLO 4: Describe the relationship between biomolecular principles and biomaterials, tissue engineering, and biomechanics.	1. Evaluation of project results based on related animation content 2. Evaluation of project report based on related content	Week 8	10%
CLO 5: Develop and create simple computer animations to illustrate an overview of biomedical engineering.	1. Evaluation of project results based on concepts, techniques used, and animation quality 2. Evaluation of project report based on related content	Weeks 5-8	20%
CLO 6: Demonstrate discipline, punctuality, and responsibility to oneself and society.	1. Evaluation based on project quality, timeliness of submission, and in-class presentation 2. Evaluation of project report based on related content	Throughout teaching period and Week 8	10%
CLO 7: Exhibit leadership, curiosity, a positive work attitude, empathy, selflessness, and a public-minded spirit; able to collaborate with others, accept and understand individual differences, and respect human rights and dignity.	1. Evaluation based on observation during teaching, assigned tasks, project quality, timeliness of submission, and in-class presentation 2. Evaluation of project report based on related content	Throughout teaching period and Week 8	10%

3. Alignment of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

CLOs	1.1	1.2	1.3	2.1	2.2	3.1	4.1
CLO 1	✓						
CLO 2				✓			
CLO 3		✓					
CLO 4			✓				
CLO 5					✓		
CLO 6						✓	
CLO 7							✓

Section 5: Teaching and Learning Resources

1. Textbooks and Core Materials

- Nuntachai Thongpan. Lecture Materials for BME101: Introduction to Biomedical Engineering, Faculty of Biomedical Engineering, Rangsit University, 2025.

- Rawipol Chotikulanun. Lecture Materials: Fundamentals of Animation Design (Fundamentals of Animation Design), Faculty of Biomedical Engineering, Rangsit University, 2023.

- Rawipol Chotikulanun. Lecture Materials: Digital Media Production Process (Digital Media Production Process), Faculty of Biomedical Engineering, Rangsit University, 2023.

- Rawipol Chotikulanun. Lecture Materials: Fundamentals of 3D Animation Creation (Fundamentals of 3D Animation Creation), Faculty of Biomedical Engineering, Rangsit University, 2023.

2. Important Documents and Information

- Assoc. Prof. Chuchart Pindaviroj et al., Biomedical Engineering Fundamentals. Biomedical Engineering Society Publisher, 2012.
- Poonsak Thanpanpanich. 3ds Max for Beginners. Luckbook, 2018.
- Simplify Editorial Board. Create 3D and Animation with 3Ds Max 2018. Simplify, 2019.
- Somrak Priyawatee. Creating Multimedia Online 2D Animation Courseware. SE-EDUCATION, 2017.

3. Reference Materials

- https://bmegtu.wordpress.com/wp-content/uploads/2018/01/bme-fund1.pdf
- https://bmegtu.wordpress.com/wp-content/uploads/2018/01/bme-fundamental-bronzino.pdf
- https://biblioseb.wordpress.com/wp-content/uploads/2018/03/introduction-to-biomedical-engineering-john-d-enderle-et-al.pdf
- https://www.sciencedirect.com/science/article/abs/pii/S0933365709000980?via%3Dihub
- https://s2.welibpublic.org/hs6/libgenrs_nonfiction/406000/7f7d183a81d006e821affcf515333085~/1748684591.cpXZvvjpAV

Section 6: Course Evaluation and Improvement

1. Strategies for Evaluating Course Effectiveness by Students

- Student evaluation of teaching effectiveness using standard online evaluation forms.
- Group discussion between instructors and students.
- Reflection based on student behavior.

2. Strategies for Evaluating Learning Management

- Reflection by students.
- Examination results.
- Evaluation by the Academic Standards Committee.

3. Mechanisms for Improving Learning Management

- Seminar on teaching and learning management.

4. Verification of Student Learning Outcomes

A committee in the program is established to verify student learning outcomes by reviewing exam questions, grading criteria, and behavioral evaluation.

5. Review and Improvement Planning

- Revise the course each year based on feedback and verification results as per item 4.
- Revise the course each year based on student evaluation results.