Subject Description Form

<table>
<tr><td>Subject Code</td><td>BME5127</td></tr>
<tr><td>Subject Title</td><td>Nanobiotechnology</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Responsible staff & Department/School</td><td>Dr Bingyang DAI (BME)</td></tr>
<tr><td>Pre-requisite / Co-requisite/ Exclusion</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>Nanobiotechnology is a rapidly growing field that deals with the application of biofunctionalized nanomaterials/nanostructures for biomedical diagnostics/imaging, drug delivery, implants, nanoscale devices, and many others. This subject commences with the fundamentals (i.e., synthesis, characterization, and unique properties) of the nanostructured materials, followed by their conjugation with biomolecules and specific applications.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:

a. Understand and discuss the fundamentals of biofunctionalized nanostructured materials;
b. Apply the unique properties of these bio-nanomaterials for novel biomedical applications;
c. Analyze the performance of these nanoscale technologies as compared to their macro- or micro-scale counterparts;
d. Appraise the value of nanobiotechnology in scientific, economic, social, and environmental contexts;
e. Identify promising areas/future directions in the nanobiotechnology field.</td></tr>
<tr><td>Contribution to Programme Outcomes (Refer to Part I Section 2)</td><td>Programme Learning Outcome (a): Acquire and apply advanced levels of knowledge and skills in BME discipline. (Teach and Measure)

Programme Learning Outcome (b): Apply critical analysis and problem-solving skills for evidence-based practice in BME discipline. (Teach and Measure)

Programme Learning Outcome (c): Demonstrate a higher level of professional competence to cope with the rapid changes in practice in BME discipline. (Teach and Measure)</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>Introductory overview; preparation, characterization, and properties of nanostructured materials (e.g., metal nanoparticle, quantum dot, carbon nanotube, polymeric nanocarrier, and silica nanoparticle); biofunctionalization of nanomaterials (e.g., cell, nucleic acid, and protein); applications of biofunctionalized nanomaterials (e.g., diagnostics and screening technologies, drug delivery); nanofabrication/nanopatterning techniques and applications; DNA nanostructures; nano materials-cell interactions; toxicity, safety, health, and environmental issues.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Students will learn the concepts and applications of nanobiotechnology in lectures. Students are required to investigate emerging nanobiotechnology areas in an individual.
<table>
<tr><td rowspan="2">Teaching/learning methodology</td><td colspan="5">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
</table>
</td></tr>
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	1. Lectures	√	√	√	√	√
	2. Individual presentation	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Individual presentation	35 %	√	√	√	√	√
2a. Quiz 1	30 %	√	√	√	√	√
2b. Quiz 2	35 %	√	√	√	√	√
Total	100 %					

For individual presentation, students have to give an oral presentation on the state-of-the-art nanotechnologies for different applications. All the assessments are aligned to the intended learning outcomes.

Guideline for individual presentation

1. Each student has a project for presentation with PPT
2. Format: 15-20 minutes presentation, 5 min Q and A
3. Assessment: 35% of overall grade. The assessment rubrics for individual presentation are also attached below for your information.
4. Content: Feel free to choose any topic related to nanomaterials for application in tissue engineering, drug delivery and sensing.
Example contents of individual presentation should include:
1) What problem you would like to solve, why you would like to solve the problem?
2) What are the current strategies to solve the problem, what are the advantages and disadvantages?
3) Potential problems of this design/system and how to solve the problem (Future optimization strategies and directions).

5. Assessment rubrics for individual presentation shown in enclosed document.

Student Study Effort Expected

Class contact:	
▪ Lectures (including group presentation)	39 Hrs.
Other student study effort:	
▪ Individual project	20 Hrs.
▪ Self-study	58 Hrs.
Total student study effort	117 Hrs.

Reading List and References

- Nanomaterials in Bionanotechnology Fundamentals and Applications (9781003139744), Singh, R.P., Singh, K.R.B., CRC Press, 2021
- Nanoengineered Biomaterials for Regenerative Medicine (9780128133569), Mozafari, M., Rajadas, J., Kaplan, D., Elsevier, 2018
- Advances in Biomaterials for Biomedical Applications (9789811033278), Editors: Tripathi, A., Melo, J.S., Springer, 2017
- Bionanomaterials (9783319620275), Editors: Piotto, S., Rossi, F., Concilio, S., Reverchon, E., Cattaneo, G, Springer, 2016

	Other Learning Materials ▪ Selected publications from relevant journals in courseware ▪ Selected videos from relevant websites in courseware
Date of Last Major Revision	30 July 2025
Date of Last Minor Revision	30 July 2025