Subject Description Form

<table>
<tr><td>Subject Code</td><td>BME5115</td></tr>
<tr><td>Subject Title</td><td>Applied Biosignal Processing</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite / Co-requisite/ Exclusion</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>To learn how to apply common signal processing techniques for various biomedical signals, through a solid understanding of digital signal processing and analysis, practices with Matlab programming, and related topic reviews.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:

a. integrate application-oriented signal processing techniques for biomedical signal analysis.
b. discuss the selection of biosignal processing techniques for real biomedical signals.
c. evaluate effects of different biomedical signal processing approaches using Matlab.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>Signals and systems for understanding biosignal processing

1. Considerations for biosignal processing during data collection and experimental design
2. Design of FIR and IIR filters with solid understanding of impulse response, system frequency response and transfer function
3. Use Median filter and moving average for smoothing biosignals
4. Use cross-correlation for biosignal registration
5. Use adaptive filters for separation of mixed signals
6. Registration of ultrasound echoes
7. Spectrum analysis for EMG signal during muscle fatigue
8. Adaptive filtering for fetus ECG
9. Matlab programming</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Students will learn the interaction between signal and system during the class, with the target for application of digital signal processing. Students will have many opportunities to practice processing and analysis of various biomedical signals using Matlab.

The discussion of theory will be reinforced by the practices using Matlab programming. Students will also be required to conduct reviews for selected topics about biomedical signal processing and a presentation is required. These teaching/learning approaches are in line with the applied nature of this subject.
<table>
<tr><td rowspan="2">Teaching/learning methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Lectures</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Labs</td><td></td><td></td><td>√</td></tr>
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Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c			
1. Assignments and laboratory reports	20%	√	√	√			
2. Class interaction and lab performances	10%	√	√	√			
3. Reviewing report and presentation	30%		√				
4. Final test	40%	√	√				
Total	100 %						

This subject is application-oriented, and the assessments focus more on how students can apply signal processing and analysis for various biomedical signals with a solid understanding of the interaction between signal and system.

Student Study Effort Expected

Class contact:	
▪ Lecture	27 Hrs.
▪ Laboratory teaching	12 Hrs.
Other student study effort:	
▪ Self-study	37 Hrs.
▪ Assignments	10 Hrs.
▪ Laboratory assignment and reports	30 Hrs.
▪ Reviewing reports	10 Hrs.
Total student study effort	126 Hrs.

Reading List and References

- Reddy DC. *Biomedical Signal Processing: Principles and Techniques*. Boston: McGraw Hill, 2005.
- Bruce EN. *Biomedical Signal Processing and Signal Modeling*. John Wiley and Sons, New York, 2001.
- Akay M. *Biomedical Signal Processing*, Academic Press, San Diego, 1994.
- Devasahayam SR. *Signals and Systems in Biomedical Engineering: Signal Processing and Physiological Systems Modeling*, Kluwer Academic/Plenum Publishers, New York, 2000.
- *IEEE Transactions on Biomedical Engineering*.