

Subject Description Form

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| Subject Code | EIE4123 |
| Subject Title | Healthcare Technology |
| Credit Value | 3 |
| Level | 4 |
| Pre-requisite/ Co-requisite/ Exclusion | Pre-requisite: EIE3311 Computer System Fundamentals / EIE3343 Computer Systems Principles AND EIE3124 Fundamentals of Machine Intelligence |
| Objectives | This subject aims at providing students with the theory, practice, and applications of advanced technologies (such as AI, blockchain, virtual reality, and 5G) in healthcare and healthcare systems. In particular, the subject enables students to understand how advanced technologies transform the healthcare systems and healthcare services. |
| Intended Subject Learning Outcomes | <p>Upon completion of the subject, students will be able to:</p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> 1. Understand how advanced technologies# can be applied to healthcare 2. Understand the benefit of using various technologies in healthcare 3. Understand the role of information technologies and data security in healthcare systems <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> 4. Understand the creative process when designing solutions to a problem <p>#Advanced technologies include AI, blockchain, AR/VR, 5G, etc.</p> |
| Subject Synopsis/ Indicative Syllabus | <p>Part I – Core</p> <ol style="list-style-type: none"> 1. Health Informatics <ol style="list-style-type: none"> 1.1. Healthcare data, information, and knowledge 1.2. Healthcare data analytics 1.3. Electronic health records 2. AI in Healthcare <ol style="list-style-type: none"> 2.1. Introduction to medical applications of AI 2.2. Computer vision: motion tracking; fall detection 2.3. Speech technologies: diagnosis of neurocognitive disorders and autism spectrum disorders; speech therapy; stress and depression detection; voice pathology detection; speech impairment 2.4. Diagnostic imaging <p>Part II – Selected Topics (2–3 out of 5 topics)</p> <ol style="list-style-type: none"> 3. Blockchain and Privacy in Healthcare <ol style="list-style-type: none"> 3.1. Key characteristics of blockchain architecture 3.2. Example Blockchain-based applications in healthcare industry: smart contracts, fraud detection, identity verification, drug traceability. 4. VR/AR for Healthcare <ol style="list-style-type: none"> 4.1. Advantages of using VR/AR for healthcare 4.2. Example VR/AR applications: Behavioural therapy, virtual and augmented surgery, virtual anatomy, training 5. Mobile Healthcare <ol style="list-style-type: none"> 5.1. ECG monitoring and recognition 5.2. Personalized mobile/wearable devices and apps 5.3. Remote patient monitoring |

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| | <p>6. Telemedicine and Telehealth</p> <p>6.1. Robotic surgery; physical therapy via digital monitoring instruments</p> <p>6.2. 5G for telehealth and remote monitoring</p> <p>7. Internet of Medical Things (IoMT)</p> <p>7.1. Introduction and technological aspects of IoMT.</p> <p>7.2. Biomedical sensors</p> <p>7.3. Example use cases of IoMT: post-surgery care, virtual home assistance, smart real-time patient monitoring, implantable sensors and cameras, diagnosis, and treatment planning</p> |
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| Teaching/Learning Methodology | <p>Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions, and specially designed classroom activities.</p> <p>Tutorials: During tutorials, students will work on/discuss some chosen topics. This will help strengthen the knowledge taught in lectures.</p> <p>Mini-project (or labs) and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.</p> <p>While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance to students to exercise their creativity in problem solving.</p> |
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| Assessment Methods in Alignment with Intended Subject Learning Outcomes | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 40%;">Specific Assessment Methods/Tasks</th> <th rowspan="2" style="width: 10%;">% Weighting</th> <th colspan="4" style="width: 50%;">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th style="width: 12.5%;">1</th> <th style="width: 12.5%;">2</th> <th style="width: 12.5%;">3</th> <th style="width: 12.5%;">4</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>• Homework and assignments</td> <td style="text-align: center;">20%</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>• Test and quizzes</td> <td style="text-align: center;">20%</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>• Lab or mini-project</td> <td style="text-align: center;">20%</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>2. Examination</td> <td style="text-align: center;">40%</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Total</td> <td style="text-align: center;">100%</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Assignment, homework, and laboratory exercises (or mini-project) will require students to apply what they have learnt to solve problems. There will be open-ended questions that allow students to exercise their creativity in making design.</p> <p>Examination and tests: They assess students' achievement of the learning outcomes in a more formal manner.</p> | Specific Assessment Methods/Tasks | % Weighting | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) | | | | 1 | 2 | 3 | 4 | 1. Continuous Assessment | | | | | | • Homework and assignments | 20% | ✓ | ✓ | ✓ | | • Test and quizzes | 20% | ✓ | ✓ | ✓ | | • Lab or mini-project | 20% | ✓ | ✓ | | ✓ | 2. Examination | 40% | ✓ | ✓ | ✓ | | Total | 100% | | | | | | | | | | |
|--|--|-----------------------------------|-------------|--|---|--|--|---|---|---|---|--------------------------|--|--|--|--|--|----------------------------|-----|---|---|---|--|--------------------|-----|---|---|---|--|-----------------------|-----|---|---|--|---|----------------|-----|---|---|---|--|-------|------|--|--|--|--|--|--|--|--|--|--|
| Specific Assessment Methods/Tasks | % Weighting | | | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Continuous Assessment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| • Homework and assignments | 20% | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| • Test and quizzes | 20% | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| • Lab or mini-project | 20% | ✓ | ✓ | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Examination | 40% | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Student Study Effort Expected | Class contact (time-tabled): | |
| | • Lectures | 24 Hours |
| | • Tutorial/Laboratory/Practice Classes | 15 Hours |
| | Other student study effort: | |
| | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes | 36 Hours |
| | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing | 30 Hours |
| | Total student study effort: | 105 Hours |
| Reading List and References | Reference Materials: <ol style="list-style-type: none"> 1. D. Jude Hemanth, J. Anitha, and George A. Tsihrintzis, "Internet of Medical Things: Remote Healthcare Systems and Applications", Springer, 2021. ISBN 978-3-030-63937-2. 2. Kelvin Chen, "Wearable Medical Technologies", Royal Collins Publishing Company. 3. V. Emilia Balas and Souvik Pal, "Healthcare Paradigms in the Internet of Things Ecosystem", Academic Press, 2020. 4. Deepak Gupta, Moolchand Sharma, Vikas Chaudhary, and Ashish Khanna, "Robotic Technologies in Biomedical and Healthcare Engineering", CRC Press, 2021. 5. Robert E. Hoyt and Ann K. Yoshihashi, "Health Informatics: Practical Guide for Healthcare and Information Technology Professionals, 7th Edition, Informatics Education, 2018. 6. Shuyun Shi, et al. "Applications of blockchain in ensuring the security and privacy of electronic health record systems: A survey", Computer Security, vol. 97, Oct. 2020. 7. Arvin Agah, "Medical Applications of Artificial Intelligence", CRC Press, 2014. 8. Arjun Panesar, "Machine Learning and AI for Healthcare", Apress, 2021. 9. C.M. Hayre, D.J. Muller, and M.J. Scherer, "Virtual Reality in Health and Rehabilitation, CRC Press, 2020. | |
| Last Updated | June 2021 | |
| Prepared by | Prof. M.W. Mak, Dr. N.F. Law, and Prof. Changyuan Yu | |