MODULE SPECIFICATION

Name of Module		Calculus					
Parent School/Dept		Computer Science/Information Systems					
Programme(s) where module is offered		BSc Computer Science with Electrical Engineering; BSc Computer Science with Economics; BSc Computer Science with Business; BSc Computer Science with International Relations; BSc Computer Science with Political Science; BSc Information Systems with Electrical Engineering; BSc Information Systems with Economics; BSc Information Systems with Business; BSc Information Systems with International Relations; BSc Information Systems with Political Science;					
Status (core, option, free choice)		Core		**Pre-Requisite Modules or Qualifications**		None	
FHEQ Level	4	**Unit Value**	8 ECTS	**Module Code**	**Math150**	**Module coordinator**	Dr. Mirna Udovicic
Term taught		Fall		**Applicable From**		2016	

Educational Aims of the Module
Math150 covers the classical topics in calculus and analysis taught to beginning engineering and science students. These include limits and continuity, differentiation and applications, integration and techniques of integration. The students will be taught formal definitions as well as statements and simpler proofs of some classical theorems, but the majority of the time will be spent on solving problems and developing problem solving techniques.

Module Outline/Syllabus

- Review of basic functions
- Limits
- Continuous functions
- Derivatives
- Rules of differentiation
- Infinite limits, asymptotes
- Local extrema, max/min on closed interval
- Rolle's Theorem, Mean Value Theorem
- First and Second Derivative Test
- Function graphing
- Riemann integral
- Fundamental Theorem of Calculus
- Techniques of Integration
- Area under a curve, between curves

Student Engagement Hours			
Type	**Number per Term**	**Duration**	**Total Time**
Lectures	30	2 hours	60 hours
Tutorials	15	2 hours	30 hours
		Total Guided/Independent Learning Hours	**110**
		Total Contact Hours	**90**
		Total Engagement Hours	**200**

Assessment Method Summary				
Type	**Number Required**	**Duration / Length**	**Weighting**	**Timing/Submission Deadline**
Assignment + Quiz	12	300 words / 30 minutes	20%	Throughout the semester
Mid-term exam	1	90 minutes	20%	Mid-semester

Test	2	60 minutes	10%	Weeks 7, 14
Final Exam	1	180 minutes	50%	End of semester

<table>
<tr><th colspan="3">Module Outcomes</th></tr>
<tr><td rowspan="2">Intended Learning Outcomes:

1. Recognise continuous functions, find discontinuities of functions
2. Find limits (finite or infinite) from definition and using rules
3. Find derivatives of functions from definition and using rules of differentiation
4. Find local/global extrema of Functions
5. Use first and second derivatives to discuss monotonicity/concavity of functions
6. Find asymptotes and sketch detailed graphs of functions
7. Have some familiarity with Riemann sums, the definition of Riemann Integral
8. Use standard integration techniques (substitution, integration by parts, integration of rational functions etc.)
9. Find areas of regions in the plane using definite integrals.</td><td>→</td><td>Teaching and Learning Strategy:

1. Lectures (ILO: 1-9)
2. Tutorials and discussions emphasising a large number of problems related to the material covered in lectures (ILO: 1-9)
3. Guided independent study (ILO: 1-9)</td></tr>
<tr><td>→</td><td>Assessment Strategy

1. Mid-term exam (ILO: 1-5)
2. Final Exam (ILO: 1-9)
3. Assignment + Quiz (ILO: 1-9)
4. Test (ILO:1-9)</td></tr>
<tr><td rowspan="2">Practical Skills

1. Ability to apply theoretical concepts in solving programming problems
2. Ability to intelligently apply mathematical solutions in both written and verbal formats
3. Ability to discuss and articulate accurately on basic design issues</td><td>→</td><td>Teaching and Learning Strategy:

1. Tutorials (PS:1-3)
2. Use of quizzes to test student subject knowledge (PS:1-3)
3. Lectures and tutor support (PS:1-3)</td></tr>
<tr><td>→</td><td>Assessment Strategy

1. Mid-term exam (PS:2)
2. Final exams (PS:1-3)
3. Assignment + Quiz (PS:1-3)
4. Test (PS:1-3)</td></tr>
<tr><td rowspan="2">Transferable Skills

1. Problem solving skills
2. Communication skills
3. Presentation skills
4. Numeracy skills</td><td>→</td><td>Teaching and Learning Strategy:

1. Tutorials (TS:1-4)
2. Lectures and tutor lead group exercises (TS:1-4)</td></tr>
<tr><td>→</td><td>Assessment Strategy

1. Mid-term exam (TS: 1, 4)
2. Final exams (TS:1, 4)
3. Assignment + Quiz (TS:1 - 4)
4. Test (TS:1, 4)</td></tr>
</table>

Key Texts and/or other learning materials

Set Text

- Stewart, J., (2015), *Calculus, Early Transcendentals*, 8th Edition, Wiley

Supplementary Materials

- Adams, R., (2013), *Calculus: A Complete Course,* 8th Edition, Prentice Hall
- University of California San Diego, (2015), Calculus Podcasts, [online], https://podcast.ucsd.edu/podcasts/default.aspx?PodcastId=1161 (Accessed 30 November 2015)
- Spivak, M., (2006), *Calculus,* 3rd Edition, Cambridge University Press
- Ostaszewski, A., (1991), *Advanced Mathematical Methods*, Cambridge University Press
- Binmore, K., Davies, J., (2011), *Calculus: Concepts and Methods*, 2nd Edition, Cambridge University Press

Please note: This specification provides a concise summary of the main features of the module and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module and programme can be found in the departmental or programme handbook. The accuracy of the information contained in this document is reviewed annually by the University of Buckingham and may be checked by the Quality Assurance Agency.

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