Course Outline – Seattle Central Community College

Course Prefix & No.:  MATH 238  
Title:  Differential Equations  
Credits:  5  

Division:  Science & Math  
Program/Department:  Mathematics  

Max Class Size:  32  
Course length:  11 weeks  
Prerequisite(s):  MATH& 153 w/ 2.0 or better within the last 3 years.  

Total Contact Hours:  55  
Mode(s) of Delivery:  
- [ ] On campus self-contained  
- [x] Correspondence  
- [ ] Tele-course  
- [ ] Online instruction  
- [ ] Hybrid (e.g., online and on campus)  
- [ ] Other (please describe):  

Lecture:  55  
(11 h. = 1 cr.)  
Lab:  
Clinical:  
Other:  
(unsupervised; 33 hrs. = 1 cr.)  

Course Description:  
This course is a first introduction to the solution of ordinary differential equations and elementary systems of differential equations. Analytic, graphical, and numerical solution methods are employed.  

Learning Outcomes:  
As a result of taking this course, students will be able to:  
- Solve differential equations of orders one and two algebraically, numerically, and graphically.  
- Solve certain systems of equations.  
- Determine equilibria stability and bifurcation values of autonomous ODES and systems.  
- Set up differential equations to model applied problems.  
- Use technology effectively (a C.A.S., a numerical solver, and calculators) in analyzing qualitative and quantitative behaviors.  

Program/Degree Outcomes:  
This course addresses the following program or degree outcomes:  
- Develop and use skills in critical thinking, quantitative analysis  
- Develop and use skills for in-person interactions with individuals and within groups.  
- Use methods and modes of inquiry specific to mathematics  
- Demonstrate effective oral and written communication, teamwork and collaboration in mathematical settings  
- Demonstrate academic honesty and ethical behavior  

Topical Outline and/or Major Divisions:  
This course covers the following topics:  
- Solving first order equations analytically: separable, linear, exact, Bernoulli, homogeneous, power series. Use change of variable to rewrite equations in solvable form. Applications to mechanics, population, and mixing problems.  
- Solving systems of equations: analytic solutions to linear, autonomous, 2 by 2 systems of d.e.’s; qualitative solution methods applied to linear and nonlinear 2 by 2 systems. Applications of species interactions including predator-prey, competition, cooperation.
- Solving second order equations analytically: linear, homogeneous, undetermined coefficients, power series, concepts of linear independence and a fundamental set of solutions. Applications of unforced (damped and undamped) and forced harmonic oscillators (resonance) found in spring-mass systems and electrical circuits.
- Qualitative methods: slope fields, Euler's method, phase line and plane analysis, bifurcations.
- Introduction to Laplace transforms.

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<tr>
<th>Distribution Area</th>
<th>Natural World</th>
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<td>Additional Information</td>
<td>Transfers to some institutions as a 300-level course.</td>
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<tr>
<td>CAC Use Only Special Designation(s)</td>
<td>☑ QSR ☐ IS ☐ C ☐ GS ☐ US ☐ None</td>
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Outline Prepared by: Bryan Johns  
Date: 4/14/2011