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Department offering the program: Electronics and Electrical Communications
Department offering the course: Physics and Engineering Mathematics

Course Specification

1- **Course basic information** :		
Course Code: PME 121 Department requirement	**Course Title:** Mathematics (4)	**Academic year:2015-2016** First year / 2nd Semester
Field: Mathematics and Basic Science	**Teaching hours: Lecture [3]**	**Tutorial [2]**

2- Course Objectives	1. To equip students with multiple, double and triple integrals technique to solve engineering problems. 2. To provide students with the basics of vector analysis, operations, and applications of integral vector functions. 3. To introduce students to different types of Special functions, Gamma, Beta and Bessel, and their properties and applications. 4. To introduce students to the field of linear programming.

3- Intended Learning Outcomes: ARS		**Course ILOs**
A- Knowledge and Understanding:	A.1. Explain Concepts and theories of mathematics and sciences, appropriate to the Engineering Mathematics (4)	A1.1 Explain Concepts and theories of mathematics appropriate to multiple integrals and Green's theorem. A1.2 Explain Concepts and theories of mathematics appropriate to vector analysis and vector Fields. A1.3 Explain Concepts of vector operations, Gradient, Divergent and Curl of vector functions and fields. A1.4 Explain Concepts of Stokes and Gauss theorems. A1.5 Explain Concepts and theories of mathematics appropriate to special functions, Gamma, Beta and Bessel, and Legendre equation. A1.6 Explain Concepts and theories of mathematics appropriate to linear programming.
	A.5. Demonstrate Methodologies of solving engineering problems, data collection and interpretation	A5.1 Demonstrate Methodologies of surface integrals problems using double integrals. A5.2 Demonstrate Methodologies of solving volume integral problems using triple integrals. A5.3 Demonstrate Methodologies of solving applications of integral vector functions problems using vector operations, Stokes and Gauss theorems. A5.4Demonstrate Methodologies of solving engineering problems using Gamma, Beta and Bessel functions and Legendre equation. A5.5 Demonstrate Methodologies of solving linear programming problem using Simplex method and Two phase simplex method.

		A5.6 Demonstrate Methodologies of solving linear programming problem using dual Simplex method.
B- Intellectual Skills	B.2. Select appropriate solutions for engineering problems based on analytical thinking.	B2.1 Select appropriate solutions for engineering problems based on analytical thinking using multiple integrals, double and triple techniques and Green's theorem. B2.2 Select appropriate solutions for engineering problems based on analytical thinking using vector operations, Stokes and Gauss theorems. B2.3 Select appropriate solutions for engineering problems based on analytical thinking using Gamma, Beta and Bessel functions and Legendre equation. B2.4 Select appropriate solutions for solving linear programming problem based on analytical thinking using Simplex method and Two phase simplex method. B2.5 Select appropriate solutions for solving linear programming problem using dual Simplex method.
C- Professional Skills	C.1. Apply knowledge of mathematics, and engineering practice integrally to solve engineering problems. C.12. Prepare and present technical reports.	C1.1 Apply knowledge of multiple integrals, double and triple techniques and Green's theorem to solve Surface and Volume engineering problems. C1.2 Apply knowledge of vector operations, Stokes and Gauss theorems to solve Vector field problems. C1.3 Apply knowledge of Gamma, Beta and Bessel functions to solve engineering applications problems. C1.4 Apply knowledge of Simplex method and Two phase simplex method to solve linear programming problems. C1.5 Apply knowledge of dual Simplex method to solve linear programming problems. C12.1 Prepare and present technical reports on Vector operations. C12.2 Prepare and present technical reports on properties of special functions. C12.3 Prepare and present technical reports on linear programming applications.
D- General Skills	D.3. Communicate effectively. D.6. Effectively manage tasks, time, and resources. D.7. Search for information and engage in life-long self-learning Mathematics (4).	D3.1 Communicate effectively in tutorial class room with the demonstrator. D6.1 Effectively manages tasks, time, and resources, when solving mathematics problems, and in exams. D7.1 Search for information and engage in life-long self-learning relevant to multiple integrals, double and triple techniques and Green's theorem. D7.2 Search for information and engage in life-long self-learning relevant to applications of Special functions.

		D7.3 Search for information and engage in life-long self-learning relevant to Linear programming problems.
4- Course Contents	Multiple integrals: Double integrals – Engineering applications of double integrals – Triple integrals – Engineering applications of triple integrals – Line integral and Green's theorem – Surface integral. Vector analysis: Scalar and vector functions – Vector fields – Gradient, Divergent and Curl of vector functions and fields– Applications of integral vector functions (Stokes and Gauss theorems). Special functions: Gamma function and its properties – Beta function and its properties Series solution of Bessel equation of first and second kind – Properties of Bessel function and its generating function – Series solution of Legendre equation – Properties of Legendre function and its generating function. Linear programming: General formulation of linear programming problem (LPP) – Matrix form of LPP – Solution of LPP using (Simplex method – Two phase simplex method) – Degeneracy and Unbounded solution of LPP – Formulation of dual LPP – Studying of some duality theorems – Solution of LPP using dual Simplex method.	
5- Teaching and Learning Methods	- Lectures - Tutorials. - Homework Exercises - Reports	
6- Teaching and Learning Methods for disable students	• Official low cost special classes for developing student skills, arranged by the faculty administration. • Assign a portion of the office hours for those students. • Face-to-face intermediate solving the problems and quizzes during the tutorial • Repeat the explanation of some of the material and tutorials.	
7- Student Assessment		
a- Assessment Methods	- Weekly sheet exercises at class room. - Quizzes. - Case study for more demonstration. - Midterm and final exams.	
b- Assessment Schedule	- Exercise sheet Weekly - Mid–Term exam: Week no 8 - Quiz –1: Week no 10 **- Final – term examination: Week no 16**	
c- Weighting of Assessment	Mid-term examination 20% Final-term examination 67% Semester work 13% Total 100%	
8- List of text books and references:		
a- Course notes	There are lectures notes prepared in the form of a book authorized by the department	
b- Text books	1. E. Kreyszig, "Advanced Engineering Mathematics", New York: John Wiley & sons, 2011.	

c- Recommended books	1. G. James, D. Burley, P. Dyke, J. Searl, N. Steele and N. Wright, "Advanced Modern Engineering Mathematics", 1993, Addison-Wesley. 2. D. Zwillinger, "Hand Book of Differential Equations", 2nd ed. New York: Academic press, 1992.
d- Periodicals, Web sites ……etc	Web Sites related to Mathematics and Mathematical engineering such as: www.sosmath.com, www.math.hmc.edu, www.tutorial.math.lamar.edu,

Course contents - ILOs Matrix

Content Topics	Week	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Multiple integrals: Double integrals – Engineering applications of double integrals, Triple integrals – Eng. applications of triple integrals, Line integral and Green's theorem – Surface integral	1-3	A1.1, A5.1, A5.2	B2.1	C1.1	D3.1, D6.1, D7.1
Vector analysis: Scalar and vector functions – Vector fields – Gradient, Divergent and Curl of vector- Applications of integral vector functions (Stokes and Gauss theorem's)	4-5	A1.2, A1.3, A1.4, A5.3	B2.2	C1.2, C12.1	D3.1, D6.1
Special functions: Gamma function– Beta function - Bessel equation of first and second kind –Legendre equation	6-8	A1.5, A5.4	B2.3	C1.3, C12.2	D3.1, D6.1, D7.2
Linear programming: General formulation of linear programming problem (LPP) – Matrix form of LPP.	10-11	A1.6			D3.1, D6.1, D7.3
Solution of LPP using (Simplex method – Two phase simplex method) – Degeneracy and Unbounded solution of LPP.	12-13	A1.6, A5.5	B2.4	C1.4, C12.3	D3.1, D6.1, D7.3
Formulation of dual LPP – Studying of some duality theorems – Solution of LPP using dual Simplex method.	14-15	A1.6, A5.6	B2.5	C1.5, C12.3	D3.1, D6.1, D7.3

Teaching and Learning Methods - ILOs Matrix

Teaching and Learning Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Lectures	A.1,A.5	B.2	C.1	D.3,D.7
tutorials	A.1,A.5	B.2	C.1	D.3,D.6,D.7
Exercises	A.1,A.5	B.2	C.1	D.3,D.6,D.7
Reports	A.1,A.5	B.2	C.1, C.12	D.6,D.7

Assessment Methods - ILOs Matrix

Assessment Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Weekly sheet exercises	A.1,A.5	B.2	C.1	D.3,D.6,D.7
Reports	A.1,A.5	B.2	C.1,C.12	D.6,D.7
Quizzes	A.1,A.5	B.2	C.1	D.6
Midterm, and Final Written exams	A.1,A.5	B.2	C.1	D.6

Authorized from department board at 15/05/2016
Authorized from college board at 05/06/2016

Course coordinator: **Head of Department:**
Prof. Dr Magdi Kamel Prof. Fathi El-Sayed Abd El-Samie