Kingdom of Saudi Arabia

The National Commission for Academic Accreditation
&
Assessment

Course Specification

Conversions Geometry

Institution: **University of Dammam**

College/Department: **College of Sciences / Department of Mathematics**

A. Course Identification and General Information

1. Course title and code: **Applied Mathematics, Math 413** N
2. Credit hours: **3**
3. Program(s) in which the course is offered: **Mathematics program**
4. Name of faculty member responsible for the course:
A specific team from the mathematics department
5. Level/year at which this course is offered: **8th level/4rd year**
6. Pre-requisites for this course (if any): **Math 212** N - **Math 214** N
7. Co-requisites for this course (if any): **N/A**
8. Location if not on main campus: **College of Sciences – Girls Campus**
9. Mode of Instruction (mark all that apply)

a. traditional classroom	X	What percentage?	85%
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	15%
d. correspondence	X	What percentage?	
f. other		What percentage?	

Comments: **The e-learning concerns the use of blackboard and online assessments.**

B Objectives

1. What is the main purpose for this course?
This course will teach a variety of powerful mathematical methods that can be used in order to solve mathematical problems that arise in numerous applications.

Upon successful completion of this course students will be able to:

Know Fourier series, Fourier integrals and their applications in partial differential equations.

Find series solutions of ODE's.

Know integral transformation and their applications in initial boundary value problems.

Know Green's functions, Sturm-Liouville Eigenvalue Problem and their applications in differential equations.

Know Bessel functions and Legendre's functions and their applications in differential equations.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

- **Create, improve and complete (beamer or power point) presentations.**
- **Update the course by comparing to the contents at other universities.**
- **Follow up on the latest books to select the most appropriate to update the contents.**
- **Create a question bank.**
- **Find web sites related to the topic.**

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Introduction to the course (description of the course, discussion on the text books related to the course, teaching strategies and assessment methods). A general review on some essential notions in PDE & Functions	**1**	**3**
series solutions of ODE's (Ordinary and singular points of a differential equations, power series, Frobenius method)	**2**	**6**
Fourier series (Periodic functions, Orthogonal functions , Fourier series; Euler Fourier formulas, Convergence of Fourier series and Dirichlet conditions, Half-range Fourier series, Parseval's identity, Solution of the wave, heat and Laplace's equations by separation of variables). Fourier integrals and Fourier transforms (Fourier sine and cosine transforms, The Fourier integral and the delta function, Parseval's identity for Fourier integrals, The convolution theorem for Fourier transforms, Calculations of Fourier transforms)	**6**	**18**
integral transformation and their applications in initial boundary value problems.	**2**	**6**
The gamma and beta functions, Bessel's and Legendre's equation (Generating function, integral representation, Recurrence formulas, Orthogonality, Legendre polynomials)	**2**	**6**
Eigenvalue Problem, Sturm Liouville systems. Green's function, The delta function and Green's function method and their applications in boundary value problems.	**2**	**6**

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory or Studio	Practical	Other: Office	Total
Contact Hours	**2*15=30**	**0**	**0**	**2*15=30**	**4*15=60**	**120**
Credit	**2*15**	**0**	**0**	**1*15**	**0**	**45**

3. Additional private study/learning hours expected for students per week.

4 h per week

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code	NQF Learning Domains	Course Teaching	Course Assessment
1.0	Knowledge		
1.1 1.2 1.3	**Knows the methods solution of ordinary differential equations by using the series solutions and Green functions.** **Knows the methods solution of partial differential equations by using the integral transformation, separation of variables and Green functions.** **Knows some of special functions in mathematical physics.**	**Interactive learning process through questions and answers in class.** **Worked examples through a sequential delivery of surveying lectures.** **Homework consisting in solving selected exercises.**	**Exams and homework are used to assess the acquired knowledge on the subject.**
2.0	Cognitive Skills		
2.1 2.2 2.3 2.4 2.5 2.6 2.7	**Find Fourier series for a given function.** **Find Fourier integrals for a given** **function.** **Use integral transformation in solving initial-boundary value problems for physical phenomenon.** **Use separation of variables in solving initial-boundary value problems for physical phenomenon.** **Apply series methods for solving ODE's.** **Constructs Green functions and use it to** **solve**	**Lectures are covered by different worked examples.** **Engage students in discussions with questions and answers.** **Homework consisting in solving selected exercises.** **Encourage and develop self education.**	**Homework include problems, solution of which requires scientific thinking, and applications of essential theorems and results of the course** **Oral and written tests.** **Explain and communicate the corrected answers of the exams and quizzes. Applying**
3.0	Interpersonal Skills & Responsibility		

3.1 3.2 3.3 3.4 3.5	**Punctual attendance of classes is required. Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time.** **Students learn to manage their time.** **Accustom students to take responsibility of self learning.** **Students should act responsibly and ethically in carrying out individual as well as group**	**Discussion.** **Explanation.** **Guidance and supervision of the group assignments for research projects.** **Assignments are given to the students at regular intervals for them to solve and submit on time.**	**Class attendance of students at the beginning of the lecture is recoded.** **Recording of submission of assignment.** **Observations, interviews, and peer evaluations.**
4.0	Communication, Information Technology, Numerical		
4.1 4.2 4.3 4.4 4.5 4.6	**Ability to communicate in written and in oral.** **Ability to perform calculations accurately and identify the fact that the results are acceptable or unacceptable.** **Ability to explain each step in the problem solving process.** **Ability to apply course concepts to mathematical problem solving model.** **Ability to use information technology in communication and projects.** **Interact with life problems using different methods of thinking and problem solving.**	**Projects.** **Oral presentations.**	**Periodic written and oral tests.** **Discussion.** **Observatio n.**
5.0	Psychomotor		
	N/A	**N/A**	**N/A**

5. Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes (Use Program LO Code #s provided in the Program**									
	1.1	**1.2**	**2.1**	**2.2**	**2.3**	**3.1**	**3.2**	**3.3**	**4.1**	**4.2**
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4.6										

6. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination.	Week Due	Proportion of Total
1	**Quizz1**	**6**	**5%**
2	**Mid-term1**	**8**	**10 %**
3	**Quizz2**	**10**	**5%**
4	**Mid-term2**	**13**	**15 %**
5	**Group work**	**Every week**	**10 %**
7	**Applied Project**	**15**	**5%**
8	**Final exam**	**As**	**50**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

4 hrs/week for students' consultation and academic advice.

E Learning Resources

1. List Required Textbooks **G. Arfkin, "Mathematical Methods For Physics." Academic Press (1985).** **R.V.Churchill, J.W. Brown, "Fourier Series and Boundary value Problems."McGraw-Hill Education(08-2000).** **Mary L. Boas: "Mathematical Methods in The Physical Sciences"John Wiley&Sons(02-2005).**
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **Lecture room with 40 seats. Smart class.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **Computer room with at least 10 systems** **Computer room with 30 seats**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **Student course evaluation at the conclusion of the course. Sample of assignments and tests. Observations and discussions during the semester.**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **Faculty assessment of the course and effectiveness of teaching delivery. Periodic self-assessment of the program.**
3 Processes for Improvement of Teaching **Participate to workshops on evaluation approaches and effective teaching methods to enable instructors to improve their teaching skill. Teaching method will focus on students' learning and on course learning outcomes.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **A committee reviews samples of student work in this course to check on the standard of grades and achievements. An external faculty member evaluates the course material and the students' work to compare the standard of grades and achievements with those at his university.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **Carry out self- assessment at every two years and external assessment invited faculty members every four years. The feedback received from these assessments will be used to plan for further improvement in the course syllabus, teaching method, and delivery of course materials.**