COURSE SPECIFICATION

Mathematical Physics-2

Phy-351

2013-14

Course Specification

Institution :**King Khalid University, Abha, Kingdom of Saudi Arabia**
College/Department : **College of Science, Department of Physics**

A Course Identification and General Information

1. Course title and code: **Mathematical Physics-2 (Phy-351)**
2. Credit hours: 2 **(Per week)**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) • **B.Sc. (Physics)**
4. Name of faculty member responsible for the course: 1. **Dr. Emad Fathy El-Shamy**
5. Level/year at which this course is offered: **Level-5**
6. Pre-requisites for this course (if any): **Mathmatical Physics-1 (PHY-251)**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: **Not applicable**

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

The purpose of this course is to teach the students fundamentals of mathematical methods in physical sciences. After completion of this course, students will have the knowledge of following;

1. **Solution of differential equations using polynomial series and Fourier's expansion, Legendre and Hermite Functions, Partial differential equations**
2. **Complex functions, Special functions**
3. **Integral transformation**

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)

- **The course contents will be periodically reviewed by the Course Committee to include new materials of relevance and to improved teaching method.**
- **We have dedicated computational physics lab in our department. Now, we are planning to introduce some mathematical software (e.g. Mathmatica)to enhance the mathematical skills of the students and provide them better understanding of the mathematical methods used in physic.**

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered

Topic	**No of Weeks**	**Contact hours**
1- Series solutions of differential equations, Legendre , and Hermite functions	04	08
2- Partial differential equations ; Separation of variables, Boundary conditions, Laplace equation ; the wave equation	03	06
3- Complex functions	03	06
4- Special function; Gamma function, Generating function, Beta function.	02	04
5- Integral transformations	02	04

2 Course components (total contact hours per semester):

Lecture: **28 hours/semester**	**Tutorial:** **N.A.**	**Practical/Fieldwork/Internship:** **N.A.**	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week)

28 hours/semester

4. Development of Learning Outcomes in Domains of Learning for each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

The student should be able to:

1- **Acquire knowledge about Solutions of differential equations using polynomial series and Fourier's expansion, Legendre and Hermite Functions, Partial differential equations, Complex functions, Special functions, and Integral transformation and their applications in physics.**

(ii) Teaching strategies to be used to develop that knowledge

- **Class lectures**
- **Interactive learning process through questions and answers in class.**
- **Practice problem sheets to help the students to understand concepts of basic mathematical methods applied in physical sciences.**

(iii) Methods of assessment of knowledge acquired

- **Written exams (midterm exam and final exam)**
- **Homework assignments**
- **Short quizzes at the end of each topic are used to evaluate the student understanding.**

b. Cognitive Skills

(i) Cognitive skills to be developed

The student should be able to:

- **Apply mathematical tools and techniques to analyze and interpret experimental results.**
- **Deduce optimum solutions for physical problems based on analytical thinking**

(ii) Teaching strategies to be used to develop these cognitive skills

- **Class lectures**
- **Group discussions**

(iii) Methods of assessment of students cognitive skills

- **Written exams (midterm and final)**
- **Homework assignments**.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

The student should be able to:

- **Think independently, set tasks and solve problems on scientific bases.**

(ii) Teaching strategies to be used to develop these skills and abilities

- *Assignment is given to the students at regular intervals for them to solve and submit. 10% of the final grade is allocated to the assignments. Late or no submission of assignments carries penalties or loss of grade points.*
- *At the starting of each lecture, questions related to the topic that was taught on the last lecture are asked and students are always encouraged to participate in classroom discussions.*

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- **Class lectures**
- **Scientific discussions in groups.**

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

The student should be able to:

1. **Apply scientific models, systems, and tools effectively.**

(ii) Teaching strategies to be used to develop these skills

- **Class lectures**
- **Scientific discussions in groups.**

(iii) Methods of assessment of students numerical and communication skills

- **Using Blackboard for assignments**

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required.

Not Applicable

(ii) Teaching strategies to be used to develop these skills

Not Applicable

(iii) Methods of assessment of students psychomotor skills

Not Applicable

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (e.g. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1.	**Class activities and attendances**	**throughout the term**	**% 15**
2.	**Home Assignments & quizzes**	**throughout the term**	**% 35**
4.	**Final Exam**	**End of semester**	**50%**

D. Student Support

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

- **Weekly work-load of every faculty includes 10 hours of office hours meant for individual students consultation. students are encouraged to consult the teacher in case of any problem related to the lectures/Assignment/Home-Work/Exercises.**

E. Learning Resources

1. Required Text(s)

1. **Mathematical Methods in the Physical Sciences**
   Mary L. Boas
   Publisher: Wiley International Edition
   ISBN-0-471-19826-0

2. Essential References

1. **Fundamentals of Mathematical Physics (Dover Books on Physics)**
   Edgar A. Kraut
   ISBN: 0486458091
   Publisher: Dover Publication (Reprint of the McGraw-Hill, Inc., New York, 1967 edition)

2. **Mathematical Methods for the Physical Sciences: An Informal Treatment for Students of Physics and Engineering**
   K. F. Riley
   ISBN: 0 521 20390 2
   Cambridge University Press

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

4-.Electronic Materials, Web Sites etc

1. http://people.uncw.edu/hermanr/phy311/MathPhysBook/index.htm
2. http://physics.syr.edu/~trodden/courses/mathmethods/

5- Other learning material such as computer-based programs/CD, professional standards/regulations:

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 (Lecture rooms, laboratories, etc.) • **Lecture room and laboratory (Sufficient)** • **Lab and lecture room should be equipped with required teaching aids; LCD projector, whiteboard, internet connection etc.**
3. Computing resources **The subject lab should be equipped with computers, which should have the configuration that must be sufficient to install and operate the subject related software.**
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**
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.** • **Analysing of the results of students**
3 Processes for Improvement of Teaching • **Course Committee will review deficiencies based on the student evaluation, faculty input, course file, and program assessment.** • **Feedback from employers and alumni surveys and graduating students' input are used to identify any deficiencies in students' ability in applying knowledge of Basic Mathematical Methods.** • **Organize workshop on 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 faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • **Not applicable**

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- **To monitor the quality of course content keeping the modern requirement in mind, it is required to organize syllabus designing workshop every alternate year. Participants in the workshop should be from the scientific industry and subject experts from the other universities. Recommendations of the experts and industry people should be taken into consideration to revise the syllabus.**