**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation & Assessment**

**T5. COURSE REPORT**

**(CR)**

A separate Course Report (CR) should be submitted for every course and for each section or campus location where the course is taught, even if the course is taught by the same person. Each CR is to be completed by the course instructor at the end of each course and given to the program coordinator

A combined, comprehensive CR should be prepared by the course coordinator and the separate location reports are to be attached.

**Course Report**

For guidance on the completion of this template refer to the NCAAA handbooks.

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| Institution: Umm Al-Qura University Date of CR: 1436/1437 |
| College/ Department: Applied Science / Mathematical Science |

A Course Identification and General Information

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| --- | --- | --- | --- | --- | --- | --- |
| 1. Course title Partial Differential Equations Code # 404305-3  Section # Male/Alabdia | | | | | | |
| 2. Name of course instructor Waleed El-Malki Location Alabdia | | | | | | |
| 3. Year and semester to which this report applies. third level | | | | | | |
| 19  19  4. Number of students starting the course? Students completing the course? | | | | | | |
| 5. Course components (actual total contact hours and credits per semester): | | | | | | |
|  | Lecture | Tutorial | Laboratory/  Studio | Practical | Other: | Total |
| Contact  Hours | 42 |  |  |  |  | 42 |
| Credit | 3 |  |  |  |  | 3 |

B- Course Delivery

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Coverage of Planned Program | | | |
| Topics Covered | Planned Contact Hours | Actual Contact Hours | Reason for Variations if there is a difference of more than 25% of the hours planned |
| **Introduction**  Definition of a partial differential equation (PDE). Definition of properties such as ‘order’ and ‘linear/nonlinear’. Descriptions of how partial differential equations arise in the context of applications. Specifically how conservation laws lead to the derivations of Laplace’s equation (elliptic), diffusion equation (parabolic) and the Wave Equation (hyperbolic). | 3 | 3 |  |
| **First order equations**  - Define the general form of a first order partial differential equation. Find  solution of first order linear equations of the generic type. Construct  particular solution from given data.  - The use of characteristic methods to solve nonlinear first order PDEs | 15 | 15 |  |
| **Classification of second order linear equation**  Classification by reduction to canonical form. Use of change of variable to find the general solution of second order linear partial differential equation in 2 variables. Determination of particular solutions from given information. | 6 | 6 |  |
| **Fourier Series and applications**  - Description of Fourier series, and its particularizations to half-range sine and cosine series. The Dirichlet conditions for the existence of a Fourier series. Proof of Dirichlet’s Theorem for the sum to infinity of a one-dimensional Fourier Series. Selected examples of the construction of Fourier series.  - Solution of linear partial differential equations by the method of separation of variables. Examples of the application of the method to the solution of boundary value problems for Laplace’s equation in two dimensions and initial boundary value problems for the diffusion equation in one-dimension. | 12 | 12 |  |
| **Introduction to Special Functions**  The derivation of Bessel’s equation and Legendre’s equation from Laplace’s equation when expressed in Cylindrical Polar coordinates and in Spherical Polar coordinates respectively.  Use of Leibnitz rule  to construct series expansions for Jn(x) and Pn(x). The concept of a Generating Function and the use of generating functions to establish algebraic and analytical properties of these functions with particular reference to the development of orthogonality conditions and their use in the construction of Fourier-Bessel and Fourier-Legendre series. Properties of the companion solutions Yn(x) and Qn(x) which may be constructed from Jn(x) and Pn(x) respectively. | 9 | 9 |  |

|  |  |  |
| --- | --- | --- |
| 2. Consequences of Non Coverage of Topics  For any topics where the topic was not taught or practically delivered, comment on how significant you believe the lack of coverage is for the course learning outcomes or for later courses in the program. Suggest possible compensating action. | | |
| Topics (if any) not Fully Covered | Effected Learning Outcomes | Possible Compensating Action |
|  |  |  |

3. Course learning outcome assessment.

|  |  |  |  |
| --- | --- | --- | --- |
|  | List course learning outcomes | List methods of assessment for each LO | Summary analysis of assessment results for each LO |
| 1.1 | List the theories and concepts used in the Partial Differential Equations | Homework and tests. |  |
| 1.2 | Identify the steps required to carry out a piece of research on a topic within Partial Differential Equations |  |
| 1.3 | Recognize an understanding of the contribution and impacts of the Partial Differential Equations in science |  |
| 2.1 | Apply appropriate theories, principles and concepts relevant to the Partial Differential Equations |  |
| 2.2 | Analyze and interpret information from a variety of sources relevant to Partial Differential Equations. |  |
| 2.3 | Demonstrate a reasoned argument to the solution of familiar and unfamiliar problems relevant to Partial Differential Equations. |  |
| 3.1 | Plan practical activities using techniques and procedures appropriate to Partial Differential Equations |  |
| 3.2 | Execute a piece of independent research using mathematics techniques of Partial Differential Equations. |  |
| 4.1 | Present oral presentation using literatures from the web Deal with appropriate effective written and oral communication skills relevant to Partial Differential Equations |  |
| 4.2 | Think independently and develop the ability to self appraise and reflect on scientific data Arabic and in English relevant to Partial Differential Equations |  |
| 4.3 | Use organization skills (including task and time management) relevant to Partial Differential Equations both individually and in a group situation |  |
| 4.4 | Deal with problems relevant to relevant to Partial Differential Equations using ideas and techniques some of which are at the forefront of the discipline. |  |

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| Summarize any actions you recommend for improving teaching strategies as a result of evaluations in table 3 above. |

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| --- | --- | --- | --- |
| 4. Effectiveness of Planned Teaching Strategies for Intended Learning Outcomes set out in the Course Specification. (Refer to planned teaching strategies in Course Specification and description of Domains of Learning Outcomes in the National Qualifications Framework) | | | |
| List Teaching Methods set out in Course Specification | Were They  Effective? | | Difficulties Experienced (if any) in Using the Strategy and Suggested Action to Deal with Those Difficulties. |
| No | Yes |
| Lectures |  | ✔ |  |
| Tutorials |  |  |  |
| Problem Solving |  | ✔ |  |

**Note:** In order to analyze the assessment of student achievement for each course learning outcome, student performance results can be measured and assessed using a KPI, a rubric, or some grading system that aligns student work, exam scores, or other demonstration of successful learning.

C. Results

1 . Distribution of Grades

|  |  |  |  |
| --- | --- | --- | --- |
| Letter  Grade | Number of  Students | Student  Percentage | Analysis of Distribution of Grades |
| A | 14 | 73.7 |  |
| B | 2 | 10.5 |  |
| C | 3 | 15.8 |  |
| D | 0 | 0 |  |
| F | 0 | 0 |  |
| Denied  Entry | 0 | 0 |  |
| In Progress | 0 | 0 |  |
| Incomplete | 0 | 0 |  |
| Pass | 0 | 0 |  |
| Fail | 0 | 0 |  |
| Withdrawn | 0 | 0 |  |

| 2. Analyze special factors (if any) affecting the results |
| --- |

|  |  |
| --- | --- |
| 3. Variations from planned student assessment processes (if any) (see Course Specifications). | |
| a. Variations (if any) from planned assessment schedule (see Course Specifications) | |
| Variation | Reason |
|  |  |
|  |  |
|  |  |
| b. Variations (if any) from planned assessment processes in Domains of Learning (see Course Specifications) | |
| Variation | Reason |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| 4. Student Grade Achievement Verification (eg. cross-check of grade validity by independent evaluator). | |
| Method(s) of Verification | Conclusion |
|  |  |
|  |  |

D Resources and Facilities

|  |  |
| --- | --- |
| 1. Difficulties in access to resources or facilities (if any) | 2. Consequences of any difficulties experienced for student learning in the course. |

E. Administrative Issues

|  |  |
| --- | --- |
| 1 Organizational or administrative difficulties encountered (if any) | 2. Consequences of any difficulties experienced for student learning in the course. |

F Course Evaluation

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| 1 Student evaluation of the course (Attach summary of survey results) |
| a. List the most important recommendations for improvement and strengths |
| b. Response of instructor or course team to this evaluation |
| 2. Other Evaluation (eg. by head of department, peer observations, accreditation review, other stakeholders) |
| a. List the most important recommendations for improvement and strengths |
| b. Response of instructor or course team to this evaluation |

G Planning for Improvement

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Progress on actions proposed for improving the course in previous course reports (if any). | | | |
| Actions recommended  from the most recent course report(s) | Actions Taken | Action Results | Action Analysis |
| a. |  |  |  |
| b. |  |  |  |
| c. |  |  |  |
| d. |  |  |  |

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| --- |
| 2. List what other actions have been taken to improve the course (based on previous CR, surveys, independent opinion, or course evaluation). |

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| --- | --- | --- | --- | --- |
| 3. Action Plan for Next Semester/Year | | | | |
| Actions Recommended for Further Improvement | Intended Action Points  (should be measurable) | Start  Date | Completion  Date | Person Responsible |
| a. |  |  |  |  |
| b. |  |  |  |  |
| c. |  |  |  |  |
| d. |  |  |  |  |
| e. |  |  |  |  |

Name of Course Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Report Completed: \_\_\_\_\_\_\_\_\_\_\_\_

Program Coordinator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Received: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_