

## T6. Course Specification (CS)

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|--------------------|--|------|--------------|
| Institution        | Najran University                                      | Date | 01-05-1439H. |
| College/Department | Faculty of Sciences and Arts / Mathematical Department |      |              |

### A. Course Identification and General Information:

|   |                                     |                   |                                  |
|---|-------------------------------------|-------------------|----------------------------------|
| 1. Course title and code<br><b>Differential Equations-1 , 321-Math-3</b>  |                                     |                   |                                  |
| 2. Credit hours : <b>3</b>  |                                     |                   |                                  |
| 3. Program(s) in which the course is offered.<br>(If general elective available in many programs indicate this rather than list programs)<br><b>Mathematics</b>   |                                     |                   |                                  |
| 4. Name of faculty member responsible for the course:<br><b>Khaled Mohammed Ali Saad AL-Homam</b>   |                                     |                   |                                  |
| 5. Level/year at which this course is offered :<br><b>7</b>   |                                     |                   |                                  |
| 6. Pre-requisites for this course (if any)<br><b>Introduction of Ordinary Differential Equations, 222-Math-3</b>  |                                     |                   |                                  |
| 7. Co-requisites for this course (if any) :<br><b>None</b>  |                                     |                   |                                  |
| 8. Location if not on main campus :<br><b>College of Science and Arts-Najran- Department of Mathematics (Male + Female)</b><br><b>College of Science and Arts-Sharoura- Department of Mathematics (Male + Female)</b> |                                     |                   |                                  |
| 9. Mode of Instruction (mark all that apply)  |                                     |                   |                                  |
| a. Traditional classroom  | <input checked="" type="checkbox"/> | What percentage?  | <input type="text" value="100"/> |
| b. Blended (traditional and online)   | <input type="checkbox"/>            | What percentage ? | <input type="text"/>             |
| c. e-learning   | <input type="checkbox"/>            | What percentage?  | <input type="text"/>             |
| d. Correspondence   | <input type="checkbox"/>            | What percentage ? | <input type="text"/>             |
| f. Other  | <input type="checkbox"/>            | What percentage?  | <input type="text"/>             |
| Comments :  |                                     |                   |                                  |

## B. Objectives

### 1. What is the main purpose for this course?

- Using the theory of existence and uniqueness in proving the existence and uniqueness of the solutions of the differential equations.
- Generalize the solution of the differential equation to solve a system of differential equations.
- Generalize the solution of differential equations with constant coefficients to solve differential equations with variable coefficients.
- Solving differential equations using infinite series.
- Using the infinite series to find a solution of the Legendre equation and the Bessel equation.
- Finding the Fourier series for special types of functions.
- Solving some of the Sturm Liouville problems.

### 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)

- Review the plan at the Council of the department of each academic year for the purpose of development and improvement.
- Study the learning difficulties faced by students while studying the course.
- Review the results of the students and analyzed qualitatively out the most important recommendations about the course.
- Encourage students to use the Internet and the site of the Professor of the course.
- Using e-learning system such as Blackboard, e-examination system, Question Mark , Elluminate, and tegrity.
- Comparing the presented syllabus with other local, regional, and global, departments respectively..
- Update learning resources for course regularly using the Internet.

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

### Course Description :

This course is discussed for solving the ordinary differential equations. In this course, the different methods of solution of second differential equation and system of equations are presented. Like variation of parameters, transformation to standard form, decompose the operator etc. Series Solutions of second order differential equations are also studied. Finally there some applications on Legendre equation, Fourier series.

### 1. Topics to be Covered :

| List of Topics   | No. of Weeks | Contact Hours |
|--|--------------|---------------|
| <b>Existence and uniqueness Theorem</b> <ul style="list-style-type: none"> <li>Picard Method for successive approximation.</li> <li>Lipschitz condition.</li> <li>The existence and uniqueness of the solution.</li> <li>Gronwall's inequality.</li> <li>Dependence the solution of the initial value problem on the initial condition.</li> </ul>   | 2            | 6             |
| <b>Solving linear systems with constant coefficients</b> <ul style="list-style-type: none"> <li>Homogeneous</li> <li>Non Homogeneous</li> </ul>  | 2            | 6             |
| <b>Solving linear differential equations of second order with variable coefficients in the following ways:</b> <ul style="list-style-type: none"> <li>variation of parameters.</li> <li>transformation to standard form.</li> <li>decompose the operator.</li> <li>Abel's method.</li> <li>replacement of the independent variable.</li> <li>exact equation.</li> <li>adjoint equation.</li> <li>reduction of order</li> </ul> | 4            | 12            |
| <b>Series Solutions of second order differential equations (Frobenius method)</b>  | 2            | 6             |
| <b>Properties of the Legendre differential equation and its solution</b><br><b>Properties of the Bessle differential equation and its solution.</b>  | 2            | 9             |
| <b>Fourier Series</b>  | 1            | 3             |
| <b>Sturm Liouville problem</b>   | 2            | 3             |

| 1.Course components (total contact hours and credits per semester): |         |          |                      |           |        |       |
|---|---------|----------|----------------------|-----------|--------|-------|
|   | Lecture | Tutorial | Laboratory or studio | Practical | Other: | Total |
| Contact Hours   | 45      |          |                      |           |        | 45    |
| Credit  | 3       |          |                      |           |        | 45    |

|  |   |
|--|---|
| 3-Additional private study/learning hours expected for students per week | 6 |
|--|---|

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| 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy. |
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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 And Course Learning Outcomes   | Course Teaching Strategies        | Course Assessment Methods            |
|------------|---|-----------------------------------|--------------------------------------|
| <b>1.0</b> | <b>Knowledge</b><br><b>By the end of the semester, the students will be able to</b>                                       |                                   |                                      |
| 1.1        | memorize the basic concepts about differential equations effectively.   | Method of discussion              | Exams, homework, and quizzes.        |
| 1.2        | use the most appropriate information that would enable them to apply differential equations in various scientific fields. | Lectures and Tutorials            | oral presentation                    |
| 1.3        | describe the appropriate way to solve the differential equations.   | Solved problems method            | Collaborative learning and Team work |
| 1.4        | list the solving of differential equations in a sequential way.   | Class motivations and discussions | Homework assignments                 |
| <b>2.0</b> | <b>Cognitive Skills</b><br><b>By the end of the semester, the students will be able to</b>                                |                                   |                                      |
| 2.1        | form the differential equations.  | Class discussions                 | Training reports                     |

| Code # | NQF Learning Domains And Course Learning Outcomes  | Course Teaching Strategies       | Course Assessment Methods |
|--------|--|----------------------------------|---------------------------|
| 2.2    | create the solutions of differential equations.  | Examples and problems            | Quizzes                   |
| 2.3    | identify the differences between the kinds of differential equations.  | Discussions through the lecture. | Quizzes                   |
| 3.0    | <b>Interpersonal Skills &amp; Responsibility</b><br>By the end of the semester, the students will be able to             |                                  |                           |
| 3.1    | take responsibility in learning through a variety of tasks and activities assigned to them.                              | Discussion                       | Homework , assignments    |
| 3.2    | be familiar to teamwork with peers in an atmosphere of cordiality and understanding with regard to real- life situations | Cooperative learning method.     | Oral presentation         |
| 3.3    | acquire necessary social skills and appropriate communication.   | Cooperative learning method      | Oral presentation         |
| 4.0    | <b>Communication, Information Technology, Numerical</b><br>By the end of the semester, the students will be able to      |                                  |                           |
| 4.1    | Communicate orally and in writing effectively  | Cooperative learning method.     | Oral presentation         |
| 4.2    | Use the communication and information technology.  | E-learning , Website             | Quizzes- Reports          |
| 5.0    | <b>Psychomotor</b>   |                                  |                           |
| 5.1    | None   | None                             | None                      |

| 5. Schedule of Assessment Tasks for Students During the Semester |  |          |                                |
|--|--|----------|--------------------------------|
|  | Assessment task (e.g. essay, test, Quizzes, group project, examination, speech, oral presentation, etc.) | Week Due | Proportion of Total Assessment |
| 1  | First exam   | 6        | 25%                            |
| 2  | Second exam  | 12       | 25%                            |
| 3  | Final exam   | 16       | 50%                            |
| 4  |  |          |                                |
|  |  |          |                                |
| 5  |  |          |                                |
| 6  |  |          |                                |

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#### 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)

Office 3 hours .

#### E. Learning Resources

1. List Required Textbooks

Hassan Mustafa Alauidy , Abdel Wahab Abbas Rajab and Sana Ali Zare (2006) , Library of Al-Roshd , Differential Equations - Part II

2. List Essential References Materials (Journals, Reports, etc.)

- [Kent; Nagle; Saff; Snider](#), Fundamentals Of Differential Equations And Boundary Value Problems (Sixth Edition), Amazon
- [Earl D. Rainville, Phillip E. Bedient](#) , Elementary Differential Equations (Seventh Edition) , Macmillan Publishing Company

3. List Electronic Materials Web Sites, Facebook, Twitter, etc.

<http://www.nu.edu.sa/gui/SubDefault.aspx?PageId=696>  
<http://lib.nu.edu.sa/digitalLibrary.aspx?PageId=1494>  
<http://lib.nu.edu.sa/SubLibrary.aspx?PageId=1491>  
<https://twitter.com/math1427?lang=ar>  
[http://en.wikipedia.org/wiki/Differential\\_equation](http://en.wikipedia.org/wiki/Differential_equation)  
<http://mathworld.wolfram.com/OrdinaryDifferentialEquation.html>  
<http://mathforum.org/differential/differential.html>

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

MATHEMATICA or MATLAB

#### 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.)

- Classrooms number of seats = 20 seat
- Computer rooms containing at most 21 PCs
- Rooms equipped with modern teaching techniques and different display devices.

2. Computing resources (AV, data show, Smart Board, software, etc.)

Data show, Smart Board.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

No need

**G. Course Evaluation and Improvement Processes:**

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Distribute questionnaires to students at the end of the semester to get a special assessment for the course.
- Evaluation of the students at the end every term.
- Interview a sample of students enrolled in the course to take their views.
- Follow-up over the performance of the students interact with the course through attendance and tests.
- Box-mail suggestions.

2. Other Strategies for Evaluation of Teaching by the Instructor or by the department.

- Presentation of the results of a sample of students on an external reviewer.
- Qualitative analysis of the results of the students.
- Use authority outside the institution.
- Box-mail suggestions.

3. Processes for Improvement of Teaching :

- Training programs and workshops for faculty members on the most important teaching methods based around the learner.
- Self-assessment by Professor article.
- Creating the right atmosphere for students through social programs, entertainment, and so on.
- Upgrading of the relationship between professor and student to be a human relationship.
- Follow the new teaching strategies.



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)

- Check and correct sample of student work by faculty members are independent.
- Exchange periodically to correct or sample tests with a faculty member of the same specialty in other faculties.
- A special committee as determined by management college at the end of each semester.

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

- Hosting a visiting professor for evaluating and developing the course with Professor of the course.
- Periodic meetings with outstanding students to see the positive and negative aspects in the course.
- Comparison with similar courses in the corresponding faculties of other universities.
- Assisted by specialists in the design and planning of programs and courses.
- Update the sources of learning of the course to make sure to keep abreast of developments in the field.
- Statistical results to assess the students' course and to benefit from its results in the improvement and development of the course.

Name of instructor : Dr. Khaled Mohammed Ali Saad AL-Homam

Signature \_\_\_\_\_ Date Report Completed: 01-05-1439 H

Name of field experience teaching staff: \_\_\_\_\_

Program coordinator :Dr. Hamoud Al-Haddad \_\_\_\_\_

Signature: \_\_\_\_\_ Date received: \_\_\_\_\_