*Course report of*

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| --- |
| **Differential Equations and Numerical Analysis - PHM 112s Spring 2021** |

|  |  |
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| **University Ain Shams** | **Faculty** **Engineering** |

**A- Basic Information**

1. **Title and code:**

**Differential Equations and Numerical Analysis - PHM 112s Spring 2021**

1. **Program(s) on which this course is given:**

**Civil and Mechanical Engineering Programs**

**3. Year/ Level of programs:** 1st year – Level 1

**1. Units/Credit hours:**

1. Lectures 3 hours per week
2. Tutorial/Practical 2 hours per week
3. Total 5 hours per week

**2. Names of lecturers contributing to the delivery of the course**

 Prof. Dr. Hamdy Mohamed Ahmed Mahmoud

 Dr. Ramy Farouk Hussein Taki Eldin

Course coordinator: Dr. Ahmed Mohamed Ibrahim El-Rafei

External evaluator ………N/A……………………

**B- Statistical Information**

No. of students attending the course: 724

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Grade | A+ | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | P | F | Sum |
| Students No. | 3 | 14 | 30 | 57 | 61 | 76 | 52 | 56 | 69 | 60 | 67 | 21 | 158 | 724 |
| Percentage | 0.41 | 1.93 | 4.14 | 7.87 | 8.43 | 10.50 | 7.18 | 7.73 | 9.53 | 8.29 | 9.25 | 2.90 | 21.82 | 100% |

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**C- Professional Information**

**C.1 – Course Lectures**

 **Teaching using Online Learning tools**

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| --- | --- | --- |
| **Course Content (Part I)** | **Lecture****Hours** | **Lecturer** |
| Introduction to ordinary differential equations (ODEs). Methods of solution for 1st order ODEs. | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
|  Methods of solution for 1st order ODEs (Continue).  | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Second order ODEs reduced to first order ODEs, Introduction to Linear ODEs with constant coefficients. Finding the complementary function solution. | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Finding particular integral solution using method of variation of parameters. Introducing Operator method to find the particular integral solution.  | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Operator method (continue). Solving System of ODEs by operator method. | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Introduction to Laplace transform, finding Laplace transform of elementary functions.  | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Inverse Laplace transform and convolution theorem.  | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Solving differential and integral equations using Laplace transform.  | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Numerical methods for solving ordinary differential equations. | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Fourier series expansion of periodic functions. | **3** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Introduction to partial differential equations (PDEs).  | **6** | Dr. Hamdy MohamedDr. Ramy Farouk |
| PDEs classification and solution. Method of separation of variables for the solution of PDEs.  | **9** | Dr. Hamdy MohamedDr. Ramy Farouk |
| Total Lectures Hours | **45** |

**Topics taught as a percentage of the content specified:**

**>90 % X 70-90 % <70%**

Reasons in detail for not teaching any topic

N/A……………………………………….

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If any topics were taught which are not specified, give reasons in detail

N/A……………………..

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**2- Teaching and learning methods:**

 Interactive Lectures

Practical training/ laboratory:

Seminar/Workshop:

Interactive Tutorials

##

Online Lectures using Microsoft Teams:

**Links to PHM 112s lectures on Microsoft Teams**

**Lecture 1:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1616401566810?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 2:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1617174855144?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 3:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1617645009703?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 4:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1618145908723?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 5:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1618715725715?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 6:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1619370496431?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 7:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1621353207867?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 8:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1622025069007?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 9:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1622538268421?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

**Lecture 10:**

https://teams.microsoft.com/l/meetup-join/19%3a425ac9469c67423d9df1d8b6d7ed89f7%40thread.tacv2/1622830022411?context=%7b%22Tid%22%3a%22ad2a8324-bef7-46a8-adb4-fe51b6613b24%22%2c%22Oid%22%3a%221c705828-237d-488b-a8eb-70116a7aff9c%22%7d

Interactive Tutorials: (Microsoft Teams)

The following links represent the **Probability (PHM112s) tutorials** (recurring every week):

**Tutorial (1): Introduction, separable and homogeneous equations**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1616803009446?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1616803009446&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1616803009446)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Saturday, March 27, 2021 1:56:49 AM

**Tutorial (2):** **Linear, Bernoulli's, Exact and Non-Exact ODE's**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1617446018313?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1617446018313&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1617446018313)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Saturday, April 3, 2021 12:33:38 PM

**Tutorial (3): 2nd order ODE's reducible to 1st.**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1618046313405?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1618046313405&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1618046313405)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Saturday, April 10, 2021 11:18:33 AM

**Tutorial (4):** **Homogeneous and Non-Homogeneous linear ODE's**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1618647207720?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1618647207720&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1618647207720)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Saturday, April 17, 2021 10:13:27 AM

**Tutorial (5): Operator Method and Simultaneous D. E’s.**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A782a1eb5b2704b5e8e05ab7b6a873c12%40thread.tacv2/1619256668882?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=aaffb227-115e-48c0-8cdf-0622345c92c8&parentMessageId=1619256668882&teamName=PHM113s%20%3A%20Differential%20equations-Tutorials-Elec%20sp%2021&channelName=sections%20(1%2C2)&createdTime=1619256668882)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Saturday, April 24, 2021 9:13:27 AM

**Tutorial (6): Numerical methods for solving ODE’s.**

[Mohammed](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1620413444307?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1620410773462&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1620413444307) Borg: Scheduled a meeting

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Friday, May 7, 2021 8:50:44 PM

**Tutorial (7): Laplace Transformation**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1621337205695?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1621337205695&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1621337205695)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Tuesday, May 18, 2021 1:26:45 PM

**Tutorial (8): Inverse Laplace Transform and Solving IVP**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1621944995607?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1621944995607&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1621944995607)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Tuesday, May 25, 2021 2:16:35 PM

**Tutorial (9): Fourier Series.**

[Mohammed Borg: Scheduled a meeting](https://teams.microsoft.com/l/message/19%3A50a70992985d4669b80dfd228f000139%40thread.tacv2/1622549466879?tenantId=ad2a8324-bef7-46a8-adb4-fe51b6613b24&groupId=604a1e0a-df12-43a3-a32f-0be8f6eaa1cf&parentMessageId=1622549466879&teamName=PHM112s%20Mechanical%20Spring%202021&channelName=sections%20(3%2C4)&createdTime=1622549466879)

posted in PHM112s Mechanical Spring 2021 / sections (3,4) at Tuesday, June 1, 2021 2:11:06 PM

## Case Study:

Other assignments/homework:

If teaching and learning methods were used other than those specified, list and give reasons:

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**3- Student assessment:**

Method of assessment Percentage of total

Written final examinations **60 %**

Practical/laboratory work  **0 %**

Mid-Term Exam  **20 %**

Online assignments/class work (Quizzes) **20%**

Total **100 %**

Members of examination committee

Prof. Dr. Hamdy Mohamed Ahmed Mahmoud

Dr. Ahmed Mohamed Ibrahim El-Rafei

 Dr. Ramy Farouk Hussein Taki Eldin

Role of external evaluator

…… **N/A** ………………………………

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**4- Facilities and teaching materials:**

 **Facilities used for teaching and learning:**

* E-Learning Program (LMS)
* Video conferencing tool (Microsoft Teams)

Totally adequate

Adequate to some extent

Inadequate

**5- Administrative constraints**

**6- Student evaluation of the course: Response of Course Team**

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**Response of Course Team**

**The comments of the students can be grouped into the following issues:**

1. **MCQ exams**
2. **Marks distributions**
3. **Assignments and Quizzes are not MCQ as Final exam**
4. **Do not suit the nature of the course**
* **Given the current circumstances, the exam duration was reduced from 3 hours to 2 hours, thus, the number of questions were reduced to 20 MCQ questions, so each question corresponded to 3 marks. The exam was carefully designed to focus on the important steps and concepts which allowed the examinations of the majority of the course topics. In addition, each question matches a step with the same marks. So, if a student fails to complete a step in a written exam, he/she will lose the same marks.
MCQ assignments were provided to the students on LMS as well as the second quiz to train on this type of questions.**
1. **Online teaching.**
* **Due to the COVID-19 pandemic, online teaching was the safest way of learning to avoid the spread of the disease. Moreover, interactive online lectures and tutorials, digital course materials (Lectures, Tutorials, Assignments) were provided to the students to facilitate the learning process.**
1. **Communication with teaching assistants**
* **It was announced many times during the lectures and tutorials to communicate with TAs and instructors through many channels. MS-Teams, during lectures, tutorials, per Mail, or even through the forum created on LMS.**

**7- Comments from external evaluator(s): Response of course team**

**N/A** …………………….. …………………………….

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**8- Course enhancement: Progress on actions identified in the previous year’s action plan:**

**N/A** …………………….. …………………………….

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**9- Action plan**

**Actions required Completion date Person responsible**

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