



Course Specification

(Bachelor)

Course Title: **Mathematical Physics-2**

Course Code: **PHYS26393**

Program: **Physics**

Department: **Physics**

College: **Science**

Institution: **University of Bisha**

Version: **3**

Last Revision Date: 25 July 2023



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A. General information about the course:

1. Course Identification

| | |
|---|--|
| 1. Credit hours: | 3 |
| 2. Course type | |
| A. University <input type="checkbox"/> | College <input type="checkbox"/> |
| Department <input checked="" type="checkbox"/> | Track <input type="checkbox"/> |
| Others <input type="checkbox"/> | |
| B. Required <input checked="" type="checkbox"/> | Elective <input type="checkbox"/> |
| 3. Level/year at which this course is offered: | 5 th Level / 3 rd year |
| 4. Course general Description | |
| This course covers a selection of advanced topics related to mathematical physics. Based on prior knowledge in mathematical science, the following topics are considered: the special functions, Fourier series, and Laplace transform. | |
| 5. Pre-requirements for this course: | |
| MATH26223 Ordinary Differential Equations | |
| 6. Co- requirements for this course: | |
| NA | |
| 7. Course Main Objective(s) | |
| Recognize the fundamentals of special functions, Fourier series, and Laplace transform. | |

2. Teaching mode (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|----|--|---------------|------------|
| 1. | Traditional classroom | 3 | 100% |
| 2. | E-learning | | |
| 3. | Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning | | |
| 4. | Distance learning | | |





3. Contact Hours (based on the academic semester)

| No | Activity | Contact Hours |
|----|-------------------|---------------|
| 1. | Lectures | 45 |
| 2. | Laboratory/Studio | |
| 3. | Field | |
| 4. | Tutorial | |
| 5. | Others (specify) | |
| | Total | 45 |

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|------|--|-----------------------------------|-----------------------------|--|
| 1.0 | Knowledge and understanding | | | |
| 1.1 | Recognize the concepts of Laplace transform. | K.1 | Lectures Solve problems | Written test Reports Homework Quizzes |
| 1.2 | define the fundamentals of special functions. | K.1 | | |
| 1.3 | describe the orthogonal functions and Fourier series. | K.1 | | |
| 2.0 | Skills | | | |
| 2.1 | Apply the concepts of Laplace transform. | S.4 | Lectures Solve problems. | Written test Reports Homework Quizzes |
| 2.2 | Solve problems related to the special functions. | S.4 | | |
| 2.3 | Solve problems in orthogonal functions and Fourier series. | S.4 | | |
| 3.0 | Values, autonomy, and responsibility | | | |
| 3.1 | Exhibit self-learning skills independently. | V.2 | Self-learning | Reports Presentation |

C. Course Content

| No | List of Topics | Contact Hours |
|----|--|---------------|
| 1. | The Laplace Transform 1. Definition of the Laplace transforms. | 4.5 |
| 2. | The Laplace Transform 2. The inverse transforms and transforms of derivatives. | 4.5 |
| 3. | The Laplace Transform 3. Translation Theorems. | 4.5 |





| | | |
|-------|--|-----|
| 4. | The Laplace Transform 4. Additional operational properties. | 4.5 |
| 5. | Special functions 1. Gamma function 2. Beta Function 3. Delta function | 4.5 |
| 6. | Special functions 4. Bessel Functions | 4.5 |
| 7. | Special functions 5. Legendre Functions | 4.5 |
| 8. | Orthogonal Functions and Fourier Series 1. Orthogonal Functions. | 4.5 |
| 9. | Orthogonal Functions and Fourier Series 2. Fourier series. | 4.5 |
| 10. | Orthogonal Functions and Fourier Series 3. Fourier Cosine and Sine Series. | 4.5 |
| Total | | 45 |

Table: The matrix of consistency between the content and the learning outcomes of the course.

| | Course Learning Outcomes | | | | | | |
|----------|--------------------------|-----|-----|-----|-----|-----|-----|
| | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 2.3 | 3.1 |
| Topic 1 | ✓ | | | ✓ | | | ✓ |
| Topic 2 | ✓ | | | ✓ | | | ✓ |
| Topic 3 | ✓ | | | ✓ | | | ✓ |
| Topic 4 | ✓ | | | ✓ | | | ✓ |
| Topic 5 | | ✓ | | | ✓ | | ✓ |
| Topic 6 | | ✓ | | | ✓ | | ✓ |
| Topic 7 | | ✓ | | | ✓ | | ✓ |
| Topic 8 | | | ✓ | | | ✓ | ✓ |
| Topic 9 | | | ✓ | | | ✓ | ✓ |
| Topic 10 | | | ✓ | | | ✓ | ✓ |



D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|----|---|--------------------------------|--------------------------------------|
| 1. | Homework, quizzes, reports, and presentation. | 1: 15 | 10 % |
| 2. | First term exam | 7: 8 | 20 % |
| 3. | Second term exam | 12:13 | 20 % |
| 4. | Final exam | End of Semester | 50 % |

E. Learning Resources and Facilities

1. References and Learning Resources

| | |
|--------------------------|---|
| Essential References | - Advanced Engineering Mathematics, 6th edition, Dennis G. Zill & Warren S. Wright, Jones & Bartlett Learning, LLC, an Ascend Learning Company, (2018). |
| Supportive References | - Mathematical Methods for Physics and Engineering, K. F. Riley, M. P. Hobson and S. J. Bence, (3rd Ed.), Cambridge University Press, (2006). - Essential Mathematical Methods for Physicists, H. J. Weber and G.B. Arfken, Academic Press, (2003). - Complex Variables and their applications, A.D. Osborne, (1999). |
| Electronic Materials | - Blackboard. - PowerPoint presentations. - Digital library of University of Bisha https://ub.deepknowledge.io/Bisha |
| Other Learning Materials | NA |

2. Required Facilities and equipment

| Items | Resources |
|----------------------|---------------------------|
| facilities | Classrooms, Physics lab. |
| Technology equipment | Data show or smart board. |
| Other equipment | NA |

F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|--|---------------------|---|
| Extent of achievement of course learning outcomes. | Teachers, students. | Direct (Final exams), Indirect (Questionnaire). |





| Assessment Areas/Issues | Assessor | Assessment Methods |
|---------------------------------|---------------------|------------------------------------|
| Effectiveness of teaching. | Teachers, students. | Indirect (Questionnaire) |
| Effectiveness of assessment. | Teachers, students. | Indirect (Questionnaire) |
| Quality of learning resources | Teachers, students. | Indirect (Questionnaire) |
| Quality of facilities available | Teachers, students. | Indirect (Questionnaire) |
| Fairness of evaluation | Peer reviewer. | Direct (Final exams reevaluation). |

G. Specification Approval Data

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|---------------------------|----------------------------|
| COUNCIL /COMMITTEE | College of Science Council |
| REFERENCE NO. | 20 |
| DATE | 17 August 2023 |

