



مركز الاعتماد
وإضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER



The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus
Special Functions

1	Course title	Special Functions
2	Course number	(0301424)
3	Credit hours (theory, practical)	3
	Contact hours (theory, practical)	3
4	Prerequisites/corequisites	(0301221)
5	Program title	B.Sc.
6	Program code	
7	Awarding institution	The University of Jordan
8	Faculty	Science
9	Department	Mathematics
10	Level of course	Optional Specialization requirement
11	Year of study and semester (s)	2 th year, 1 st and 2 nd semesters
12	Final Qualification	B.Sc. in Mathematics
13	Other department (s) involved in teaching the course	None
14	Language of Instruction	English
15	Date of production/revision	

16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

18. Course Description:

Series solutions of differential equations. Gamma and Beta functions, Legendre polynomials and functions, Bessel functions, Hermite and Laguerre polynomials, Chebyshev polynomials, Hypergeometric functions. Other special functions. Hyper-geometric functions. Other special functions.

19. Course aims and outcomes:**A- Aims:**

1. To solve some differential equations using special functions
2. To evaluate some integrals using special functions.
3. To prove some properties of the special functions
4. To prove some recurrence relations

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to ...

Successful completion of the course should lead to the following outcomes:

A. Knowledge and Understanding Skills: Student is expected to

- A1) List some properties of some special functions.
- A2) Memorize some recurrence relations
- A3) Recognize some types of differential equations

B. Intellectual Analytical and Cognitive Skills: Student is expected to

- B2) Solve some differential equations using special functions
- B3) Evaluate some integrals using special functions.

C. Subject- Specific Skills: Student is expected to

- C1) Prove some recurrence relations
- C2) Prove some orthogonal properties.

D. Creativity /Transferable Key Skills/Evaluation: Student is expected to

- D1) Think independently, set tasks and solve some problems.
- D2) Solve some particular problems.

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
1. Revision 1.1 Factorials and Binomial Coefficients. 1.2 Infinite Series.	1			A1	
2. Gamma, Beta and Error Functions 2.1 Definition of Gamma function. 2.2 Integral representation of Gamma Function. 2.3 Definition of Beta function with examples. 2.4 Stirling's formula. 2.5 Error function.	2-4			A1	
3. Legendre Polynomials 3.1 The generating polynomial. 3.2 Recurrence relations. 3.3 Legendre's differential equations. 3.4 Rodrigues formula. 3.5 Orthogonality property.	5-6			A1	
4. Other orthogonal polynomials 4.1 Hermite polynomials. 4.1.1 Defention by generating functions. 4.1.2 Recurrence relations 4.1.3 Hermite's equation 4.1.4 Orthogonal property 4.2 Laguerre polynomials 4.2.1 The generating function 4.2.2 Recurrence relations and Lagurre's equation 4.2.3 Orthogonality property 4.2.4 Rodrigue formula 4.2.5 Laguerre series 4.3 Chebyshev polynomials. 4.3.1 Chebyshev polynomials of first and second kind 4.3.2 Recurrence formula 4.3.3 Orthogonality property	7-9			A1	
5. Bessel Functions 5.1 Bessel functions of first kind and generating functions 5.2 Bessel functions of nonintegral order 5.3 Recurrence formulas 5.4 Bessel's differential equations 5.5 Integrals of Bessel's functions 5.6 Orthogonality 5.7 Bessel functions of second kind and recurrence formulas	10-12			A1	

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

In order to succeed in this course, each student needs to be an active participant in learning – both in class and out of class.

- The instructor will spend most of the class time on presenting the new material as well as on discussing homework problems.
- Group work in this class is encouraged.
- To actively participate in class, you need to prepare by reading the textbook and to do all assigned problems before class. (Problems will be assigned each class period, then to be discussed the following period).
- You should be prepared to discuss your homework at each class meeting.
- You are encouraged to work together with other students and to ask questions and seek help from your professor, both in and out of class.
- Students are also encouraged to use graphing calculators extensively and to use computer software supplements.

22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

ILO/s	Learning Methods	Evaluation Methods	Related ILO/s to the program
	Lectures	Exam A1	

23. Course Policies:

1. Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.
2. If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.
3. Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.
4. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
5. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on homework.

24. Required equipment:

Data Shows

25. References:

A- Required book (s), assigned reading and audio-visuals:

Special Functions of mathematics for engineers

B- Recommended books, materials, and media:

Special Functions by Leon M. Hall

Special Functions: An Introduction to the Classical Functions of Mathematical Physics

26. Additional information:

Name of Course Coordinator: Signature: ----- Date:

Head of curriculum committee/Department: Signature: -----

Head of Department:: -----

Head of curriculum committee/Faculty: Signature: -----

Dean:Signature: -----

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File