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**Department of** General Sciences

**College of** Basic education

**University of** Salahaddin University -Erbil

**Subject:** Mathematics

**Course Book** Year 1**/First Semesters**

**Lecturer's name** Zhyan R. Ali

**Academic Year:** 2021-2022

**Course Book**

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| **1. Course name** | Mathematics |
| **2. Lecturer in charge** | Zhyan R. Ali |
| **3. Department/ College** | Mathematics/ Basic Education |
| **4. Contact** | e-mail :zhyan.ali@su.edu.krd |
| **5. Time (in hours) per week**  | Theory: 3 |
| **6. Office hours** |  |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | 1) B.Sc. in Mathematic. Mathematic Department- College of Education- Salahaddin University- Erbil in 1997.2) M.Sc. in Mathematic. Mathematic Department- College of Science - Salahaddin University- Erbil in 2010. |
| **9. Keywords** | Calculus (limit, continuity, differentiation, integration,...) |
| **10. Course overview:**Mathematics weaves together previous study of algebra, geometry, and functions. The course focuses on the mastery of critical skills and exposure to new skills necessary for success in subsequent math courses. Calculus is a foundational course; it plays an important role in the understanding of science, engineering, economics, and computer science, among other disciplines. Calculus also provides important tools in understanding functions and has led to the development of new areas of mathematics including real and complex analysis, topology, and non-Euclidean geometry. This introductory calculus course covers differentiation and integration of functions of one variable, with applications. After completing this course, students should have developed a clear understanding of the fundamental concepts of single variable calculus and a range of skills allowing them to work effectively with the concepts.The general objective of this course is to deeper understanding and working knowledge of mathematics. Also we have other aims such as awareness of applications of calculus in mathematics and physics and to develop understanding of mathematics. moreover one of the goals of the course is learn to think creatively, be able to attack a problem you have not seen before, develop tools for that, develop a mathematical model for a given 'real life' situation. |
| **11. Course objective:**1. Familiar with kinds of functions and properties2. Use graphical and numerical evidence to estimate limits, and to identify situations where limits fail to exist.3. Apply rules of limits to calculate limits.4. Use the limit concept to determine where a function is continuous.5. Use the Intermediate Value Theorem to identify an interval where a continuous function has a root.* 6. Calculate derivatives (of first and higher orders).
* 7. Use L'Hospital's rule to evaluate certain indefinite forms.
* 8. Calculate derivatives of logarithmic, exponential and inverse trigonometric functions.
* 9. Find critical points, and use them to locate maxima and minima.
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| **12. Student's obligation**• Attend and participate in lecture discussions • Attend and complete weekly exams |
| **13. Forms of teaching**White board, Colorful markers, PowerPoint, data show. |
| **14. Assessment scheme**Term Exams 40% Final exam 60% |
| **15. Student learning outcome:**1. Apply the definition of limit to evaluate limits by multiple methods and use it to derive the definition and rules for differentiation and integration. 2. Use derivatives to analyze and graph algebraic and transcendental functions. 3. Select and apply appropriate models and differentiation techniques to solve problems involving algebraic and transcendental functions.  |
| **16. Course Reading List and References‌:**▪Key references: Thomas Calculus, 2005 (Eleventh edition) Gworge. Thomas.▪Useful references:1. Calculus 5th Edition-James stewart.2. Calculus Demystified, 2003 Steven G.Krantz. |
| **17. The Topics:** | **Lecturer's name** |
| Real number, rules for inequality, Intervals | Week 1 |
| Function, identify function and their graphs  | Week 2 |
|  Absolute Value properties and solving equations involving absolute values, Greatest and least integer function | Week 3 |
| One-to-One Functions ,Even and Odd Functions , Composite Functions  | Week 4 |
| Limit (by definition and rules), one sided limits | Week 5 |
| sandwich theorem and limits of special Trigonometric functions | Week 6 |
| Limits at infinity, infinite limit | Week 7 |
| Continuity, intermediate value theorem | Week 8 |
| Tangent and derivative, slope and tangent line | Week 9 |
| Differentiation (by definition and rules) | Week 10 |
| Trigonometrically function(periodic, addition, double angle formula) | Week 11 |
| Inverse Functions, Inverse Trigonometrically function | Week 12 |
| Derivative of Trigonometric function and inverse function | Week 13 |
| **19. Examinations:** **Q1// A- Define a function. B) Is a function** $f\left(x\right)=\frac{1}{\left[x\right]-3}$ **continuous at** $x=3$**.**  **C)** **Find a domain and range of f(x).**  **D) Determine whether the function even, odd or neither. Explain your answer.** **Q2//A) Find** $ \frac{dy}{dx}$ **for each of the following** $ 1.y=\left(x^{2}+1\right)sin^{5}x$ **B) Show that y=|x| is not differentiable at x= 0**  **C) prove that** **Q1// A//**Find $ \frac{dy}{dx}$ for each of the following: $Y=5^{cosx}$ 2)$ Y=xsinx^{x}$ 3) $Y=3u^{2}$ & $U=\sqrt{x^{2}+5}$**B//** Show that $f\left(x\right)=\left|x\right|$ is not differentiable at $x=0$**C//** Prove that $\frac{d}{du}(cos^{-1}\frac{u}{a})=\frac{-1}{\sqrt{a^{2}-u^{2}}}$ **D//** Is a function $f\left(x\right)=\frac{1}{\left[x\right]-2}$ continuous at $x=2$. Q1// Find the limit of each of the following$$1)\lim\_{n\to \infty }\sqrt[n]{0.5} 2)\lim\_{n\to \infty }\frac{1}{lnx}-\frac{1}{x-1} 3)\lim\_{x\to \infty }\frac{x^{5}}{5!} $$B) Show that $\lim\_{x\to \infty }\left(1+\frac{5}{x}\right)^{x}=e^{5}$.Q1// Find the limit of each of the following: $1)\lim\_{n\to \infty }\sqrt[n]{0.5} 2)\lim\_{n\to \infty }\frac{1}{lnx}-\frac{1}{x-1} 3)\lim\_{x\to \infty }\frac{x^{5}}{5!} $B) Show that $\lim\_{x\to \infty }\left(1+\frac{5}{x}\right)^{x}=e^{5}$. |
| **20. Extra notes:**Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. |
| **21. Peer review** .‌‌  |