QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Department of Mathematics

Study plan No.	**2021/2022**		**University Specialization**	**Bachelor of Mathematics**			
Course No.	**0101202**		**Course name**	**Advanced Calculus**			
Credit Hours	**3**		**Prerequisite/ Co-requisite**	**Calculus (3)**			
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	✓ **Mandatory requirements**	☐ Elective requirements	
Teaching style	☐ Full online learning		☐ Blended learning		✓ **Traditional learning**		
Teaching model	☐ 1 Synchronous: 1 asynchronous		☐ 1 face to face : 1 asynchronous		✓ **2 Traditional**		

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**
1				Traditional	

Brief description

Line and surface integrals, Jacobian determinant, Change of variables, Green's theorem, Curl and divergence of a vector field, Divergence theorem**.**

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Calculus, by Anton, Bivens and Davis, 10th Ed, 2012			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Calculus, by Finney and Thomas, 14nd Ed., 2018 2. Calculus, one and several variables, by Salas and Hille, 10th Ed, 2007 3. Vector Calculus, by Susan Colley, 4rd Ed, 2012.			
Supporting websites	https://www.khanacademy.org/math/multivariable-calculus\			
The physical environment for teaching	✓Class room	☐ labs	☐ Virtual educational platform	☐ Others
Necessary equipment and software				
Supporting people with special needs				
For technical support				

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Recognize mathematical formulas and methods of derivation of multivariable functions	**MK2**

K2	State the integration techniques to calculate multiple integrals in different coordinate systems..	**MK2**
K3	Memorize the different theorems of vector calculus.	**MK3**
	Skills	
S1	Perform differential calculus operations on functions of several variables including continuity, partial derivatives and directional derivatives.	**MS1**
S2	Estimate multiple integrals in different coordinate systems including Cartesian, polar, cylindrical and spherical coordinates	**MS2**
S3	Perform calculus operations on vector-valued functions.	**MS2**
	Competences	
C1	Apply the computational and conceptual principles of calculus to the solutions of various scientific applications	**MC1**
C2	Develop the individual's ability to communicate and interact with other mathematical courses.	**MC2**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	30%	**30%**	30%
Participation / practical applications	.	.	**20%**	30%
Asynchronous interactive activities	30%	30%	**0%**	.
Final exam	40%	40%	**50%**	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Review of Vectors. Parametric Equations of Lines Vector Equation of Lines	Lecture	767 - 813
2	Planes in 3-Space. Intersecting Planes Introduction to Vector-Valued Functions	Lecture	813 - 821 841 - 847
3	Graphs of Vector-Valued Functions Calculus of Vector-Valued Functions: Limits, Continuity, and Derivatives. Derivative Rules, Definite Integrals	Lecture	848 - 853
4	Antiderivatives of vector–valued functions Arc length. Properties of Arc Length Parameterizations	Lecture	853 - 868
5	Unit tangent, Normal, and Binormal vectors. Curvature Motion along a curve(velocity, acceleration, and speed).	Lecture	868 - 905
6	Directional derivative. The Gradient	Lecture	960 - 971
7	Tangent Planes and Normal Vectors Vector Fields. Divergence and Curl	Lecture	971 – 976 1088 - 1093
	Line Integrals with Respect to Arc Length. Evaluating Line	Lecture	1094 - 1102

8	Integrals. Line Integrals with Respect to x, y, and z. **Midterm Exam**		
9	Integrating a Vector Field Along a Curve. Work as a Line Integral Line Integrals along Piecewise Smooth Curve	Lecture	1102 - 1109
10	Independence of path. Conservative Vector Field Test for Conservative Vector Fields. Green's Theorem	Lecture	1111 - 1125
11	Green's Theorem for Multiply Connected Regions Triple Integrals.	Lecture	1125 – 1129 1039 – 1048
12	Volume Calculated as a Triple integrals Triple Integrals in Cylindrical and Spherical Coordinates	Lecture	1048 – 1057
13	Surface Integrals	Lecture	1130 - 1138
14	Applications of Surface Integrals; Flux The Divergence Theorem	Lecture	1138 – 1158
15	Stokes' Theorem Relationship between Green's Theorem and Stokes' Theorem	Lecture	1158 – 1168
16	**Final Exam 50%**		