Minutes of the 31st
Special Meeting of the Board of Studies
Faculty of Engineering Sciences
held on
4th September 2023
through Microsoft Teams

Bahria University Islamabad

Contents

Minutes of the 31st Special Meeting of Faculty Board of Studies Engineering Sciences held on 4th September, 2023 through Microsoft Teams

Attendance:

BUIC		
Snr. Prof. Dr. Atif Raza Jafri	Dean ES	Chair
Snr. Assoc. Prof. Dr. Said Akbar Khan	HoD(E&ES)	Member
Snr. Assoc. Prof. Dr. Arif ur Rehman	HoD(CS)	Member
Snr. Assoc. Prof. Dr. Awais Majeed	HoD(SE)	Member
Assoc. Prof. Dr. Shahzad Ahmed	HoD(CE)	Member
Assoc. Prof. Dr. Junaid Imtiaz	HoD(EE)	Member
BUKC		
Assoc. Prof. Dr. Mukesh Kumar Maheshwari	HoD(EE)	Member
Assoc. Prof. Dr. Salma Hamza	HoD(E&ES)	Member
Assoc. Prof. Dr. Syed Safdar Ali	HoD(CS)	Member
Snr. Assoc. Prof. Dr. Sohaib Ahmad	Associate Dean	Member
Snr. Asst. Prof. Dr. Shoaib Mughal	HoD(CE)	Member
Snr. Assoc. Prof. Dr. Osama Rehman	HoD(SE)	Member
BULC		
Snr. Asst. Prof. Dr. Khawaja Qasim Maqbool	HOD(CS)	Member

Proceedings

Preliminaries

FBoS-ES meeting took place on 4th September 2023, with the quorum complete, the proceedings commenced at 1230 hrs, with recitation from the Holy Quran.

In his opening remarks, the Chair stressed the importance for participation in the proceedings while staying focused on the point under deliberation.

Item3101: Starting CS Department at H-11 Campus

New Items:

Sponsor: Dean ES Referral Authority: FBOS ES

Summary of the Case

- Keeping in view the interest of the students in computing programs and availability of adequate spaces, lab facilities and trained faculty, BU higher management has directed to establish the CS department and start BSCS and BSAI program at H-11 campus.

Discussion

The sponsor presented the agenda point. The house had a detailed discussion on the feasibility which is already approved through a case file vide reference BU-HO/Acad/2023/516. No further changes have been proposed. Hence, case is to be referred to ACM for ratification.

Decision 3101

Item3102: Updated Roadmaps according to HEC UG Policy

Sponsor: All ES HODs Referral Authority: FBOS ES

The case to be forwarded for the ratification in ACM.

Summary of the Case

- New HEC UG policy has been launched recently.
- Roadmaps of all UG programs of ES are required to be aligned according to this new policy.
- A comparison of existing engineering programs (BCE, BEE and BSE) curriculum with HEC UG policy is also conducted.

Discussion

The sponsor presented the agenda point. The house had a detailed discussion about updated roadmaps. The house recommends the proposed roadmaps attached at appendage 3102. The updated roadmaps are to be approved through case file and to be implemented wef Fall-23. The working of engineering programs to be sent to PEC and HEC to take further directions.

Decision 3102

The curriculums to be approved on case file and later send to ACM for ratification.

Item3103: Admission Criteria Change in BEE Program

Sponsor: HOD EE Referral Authority: FBOS ES

Summary of the Case

- Based on the PEC letter related to amendments in PEC regulations regarding revised eligibility criteria of BEE program, approval of following admission criteria was taken on case file and was promulgated by admission directorate through letter BU-HO/Admission/2023/L/461.
  - F.Sc. (Pre-Engineering)/A-levels/relevant DAE with (Physics, Chemistry and Mathematics) with minimum 60% marks
  - A combination of Physics, Mathematics and Computer Studies/ Computer Science (ICS) with minimum 60% marks is also allowed for admission in BEE program with Chemistry as a remedial subject course to be passed in 1st Semester after admission.
- Matter is put forward in front of FBoS Member to send the case for ratification in ACM.

Discussion
The sponsor presented the agenda point. The house had a detailed discussion about new eligibility criteria. The house recommended to send the case for ratification in ACM. It was also decided to offer already approved 2 CH course of chemistry with course code GSC 340 to the students having computing background.

Decision 3103
The case to be forwarded for the ratification in ACM.

Closing of the Meeting

There being no further points, the Chair brought the meeting to close, thanking the participants for their wholehearted participation in both sessions.

Prof. Dr Atif Raza Jafri
Dean (ES), Head FBOS
September, 2023

Distribution:

	Rector, Pro-Rector, Registrar
BUHQ:	DAA
BUKC:	DG BUKC, DKC HOD(EES)

Appendages:

Appendage 3102

BS ROBOTICS & INTELLIGENT SYSTEMS (BS-RIS) ROADMAP

Prog Title	Total CH	Compliance of HEC UEP 2023 Requirements (Yes / NO)							
BS RIS	131 CH	CH Limit	Gen Edn	Major/ Disciplinary	Interdisciplinary/ Allied	Field Experience/ Internship	Capstone Project	Add'l Major/ Minor	AD Entry/ Exit
		120-144 CH	Yes 36 CH	Yes 77 CH	Yes 12 CH	Yes (Graded non-credited)	Yes FYP 6 CH	No	BU does not offer AD in RIS. Can be added in future by introducing ADP Program in RIS. In current form exit is possible as all GE are covered in first 4 semesters and total credit hours in first 4 semesters are more than 60 and less than 72.

Note: The roadmap of BS (RIS) has been developed based on HEC Undergraduate Policy 2020. The curriculum of RIS Programs was approved in 44th ACM and mostly aligned with HEC UG policy as shown above. However, in its present form it does not cover the aspect of completing general education in the first 4 semesters. A new semester wise course plan has been discussed in FBoS and is presented below for approval. The changes in course offering are highlighted in red color.

Semester-1:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	None	GSC 114	Applied Physics	2	2	0
2	None	GSL 113	Applied Physics Lab	1	0	1
3	None	GSC 110	Applied Calculus and Analytical Geometry	3	3	0
4	None	ISL 101/ HSS 116	Islamic Studies/ Ethics	2	2	0
5	None	ENG 101	Functional English	3	3	0
6	None	CSC 110	Computing Fundamentals	2	2	0
7	None	CSL 110	Computing Fundamentals Lab	1	0	1
8	None	EEL 121	Engineering Drawing & CAD	1	0	1
9	None	ISL 107	Tajweed	Non-Credited 1 hour per week	0	0
Total Credit Hours in Semester-1				15	12	3

Semester-2:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	XXXX	XXXX	Social Sciences Elective-I	2	2	0
2	None	GSC 123	Linear Algebra and Differential Equations	3	3	0
3	None	GSC 115	Circuit Analysis	3	3	0
4	None	GSL 115	Circuit Analysis Lab	1	0	1
5	None	CSC 113	Computer Programming	3	3	0
6	None	CSL 113	Computer Programming Lab	1	0	1
7	None	MSC 231	Engineering Mechanics	3	3	0
8	None	XXXX	Management Elective	2	2	0
9	None	ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0	0
Total Credit Hours in Semester-2				18	16	2

Semester-3:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	None	CEN 120	Digital Logic Design	3	3	0
2	None	CEL 120	Digital Logic Design Lab	1	0	1
3	CSC 113	CSC 210	Object Oriented Programming	3	3	0
4	CSC 113	CSL 210	Object Oriented Programming Lab	1	0	1
5	None	RIS 231	Introduction to Robotics	3	3	0
6	None	RIL 231	Introduction to Robotics Lab	1	0	1
7	None	GSC 122	Probability and Statistics	3	3	0
8	None	EEL 113	Engineering Workshop	1	0	1
9	None	ENG 134	Communication Skills	2	2	0
10	ISL 108	ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0	0
Total Credit Hours in Semester-3				18	14	4

Semester-4:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	GSC 110	GSC 220	Complex Variable & Transforms	3	3	0
2	XXXX	XXXX	IDEE - I	3	3	0
3	XXXX	XXXX	IDEE - I Lab	1	0	1
4	CSC 210	AIC 201	Artificial Intelligence	3	3	0
5	CSC 210	AIL 201	Artificial Intelligence Lab	1	0	1
6	None	PAK 105	Pakistan Studies	2	2	0

7	None	XXXXX	Civics and Community Engagement Elective	2	2	0
8	None	ENG 320	Technical Writing & Presentation Skills	3	3	0
9	ISL 109	ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0	0
Total Credit Hours in Semester-4				18	16	2

Semester-5:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	XXXX	XXXX	IDEE – II	3	3	0
2	XXXX	XXXX	IDEE - II Lab	1	0	1
3	CSC 210	RIS 361	Robotic System & Programming	3	3	0
4	CSC 210	RIL 361	Robotic System & Programming Lab	1	0	1
5	GSC 220	EEN 412	Linear Control System	3	3	0
6	GSC 220	EEL 412	Linear Control System Lab	1	0	1
7	None	RIS 241	Sensors & Actuators	3	3	0
8	None	RIL 241	Sensors & Actuators Lab	1	0	1
9	ISL 110	ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0	0
Total Credit Hours in Semester-5				16	12	4

Semester-6:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	XXXX	XXXX	IDEE - III	3	3	0
2	XXXX	XXXX	IDEE - III Lab	1	0	1
3	CEN 120	CEN 440	Embedded Systems Design	3	3	0
4	CEN 120	CEL 440	Embedded Systems Design Lab	1	0	1
5	AIC 201	RIS 364	Machine Learning	3	3	0
6	AIC 201	RIL 364	Machine Learning Lab	1	0	1
7	XXXX	XXXX	RIS Elective I	3	3	0
8	ISL 111	ISL 112	Understanding Quran-v	Non credited 1 hour every week	0	0
Total Credit Hours in Semester-6				15	12	3

Semester-7:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	EEN 412	RIS 362	Robot Modelling & Control	3	3	0
2	EEN 412	RIL 362	Robot Modelling & Control Lab	1	0	1
3	XXXX	XXXX	RIS Elective II	3	3	0
4	XXXX	XXXX	RIS Elective II Lab	1	0	1
5	AIC 301	RIS 474	Introduction to Deep Learning	3	3	0
6	AIC 301	RIL 474	Introduction to Deep Learning Lab	1	0	1
7	None	FYP 400	Project -I	3	0	3
9	None	ISL 113	Seerah-i	Non credited 1 hour every week	0	0
Total Credit Hours in Semester-7				15	9	6

Semester-8:

S.No.	Pre-Requisite	Course Code	Course Title	Credit Hours	Theory	Lab
1	XXXX	XXXX	RIS Elective III	3	3	0
2	RIS 231	RIS 481	Machine Vision & Robotics	3	3	0
3	XXXX	XXXX	RIS Elective IV	3	3	0
4	XXXX	XXXX	RIS Elective IV Lab	1	0	1
5	XXXX	XXXX	RIS Elective V	3	3	0
6	None	FYP 400	Project-II	3	0	3
7	ISL 113	ISL 114	Seerah-ii	Non credited 1 hour every week	0	0
Total Credit Hours in Semester-8				16	12	4

Internship Non-Credit
Total Credit Hours: 131

List of Courses

General Education Courses (32 credit hours)

Sr. No	Pre-req	Course Code	Course Title	Theory	Lab	CR
1	None	GSC 113	Applied Physics	2	0	2
2	None	GSL 113	Applied Physics Lab	0	1	1
3	None	ISL 101/ HSS 116	Islamic Studies/ Ethics	2	0	2
4	None	ENG 101	Functional English	3	0	3
5	None	ENG 134	Communication Skills	2	0	2
6	None	PAK 105	Pakistan Studies	2	0	2

7	None	ENG 320	Technical Writing & Presentation Skills	3	0	3
8	None	CSC 110	Computing Fundamentals	2	0	2
9	None	CSL 110	Computing Fundamentals Lab	0	1	1
10	None	GSC 110	Applied Calculus and Analytical Geometry	3	0	3
11	GSC 110	GSC 220	Complex Variable & Transform	3	0	3
12	None	GSC 123	Linear Algebra and Differential Equations	3	0	3
13	None	GSC 122	Probability and Statistics	3	0	3
14	None	XXXXX	Civics and Community Engagement Elective	2	0	2

Social Science Course (2 credit hours)

Sr. No	Pre-req	Course Code	Course Title	Theory	Lab	CR
1	None	HSS 424	Engineering Ethics	2	0	2
2	None	HSS 217	Introduction to Sociology	2	0	2
3	None	HSS 119	Introduction to International Relations	2	0	2

Management Science Course (2 credit hours)

Sr. No	Pre-req	Course Code	Course Title	Theory	Lab	CR
1	None	HSS 423	Entrepreneurship	2	0	2
2	None	MGT 421	Leadership	2	0	2
3	None	EMG 222	Principles of Management	2	0	2
4	None	HSS 412	Engineering Economics	2	0	2

Interdisciplinary Courses Electives (IDEE 12 credit hours)

Sr. No	Pre-req	Course Code	Course Title	Theory	Lab	CR
1	CSC 210	CSC 221	Data Structures & Algorithm	3	0	3
2	CSC 210	CSL 221	Data Structures & Algorithm Lab	0	1	1
3	None	EEN 313	Signal & Systems	3	0	3
4	None	EEL 313	Signal & Systems Lab	0	1	1
5	GSC 115	EEN 224	Electronic Devices and Circuits	3	0	3
6	GSC 115	EEL 224	Electronic Devices and Circuits Lab	0	1	1
7	GSC 115	EEP 468	Power Electronics	3	0	3

8	GSC 115	EEL 468	Power Electronics Lab	0	1	1
9	None	CEN 223	Computer Communication & Networks	3	0	3
10	None	CEL 223	Computer Communication & Networks Lab	0	1	1
11	GSC 114	EEN 312	Electrical Machines	3	0	3
12	GSC 114	EEL 312	Electrical Machines Lab	0	1	1
13	GSC 114	EEN 316	Instrumentation and measurement	3	0	3
14	GSC 114	EEL 316	Instrumentation and measurement Lab	0	1	1
15	None	EET 321	Communication Systems	3	0	3
16	None	EEL 321	Communication Systems Lab	0	1	1
17	None	CEN 444	Digital Image Processing	3	3	0
18	None	CEL 444	Digital Image Processing Lab	1	0	1

Final Year Project (06 credit hours)

1	None	FYP 400	Project -I	0	3	3
2	None	FYP 400	Project -II	0	3	3

Robotics and Intelligent Systems Core Courses (60 Credits)

Sr. No	Pre-req	Course Code	Course Title	Theory	Lab	CR
1	None	MSC 231	Engineering Mechanics	3	0	3
2	None	GSC 115	Circuit Analysis	3	0	3
3	None	GSL 115	Circuit Analysis Lab	0	1	1
4	None	CEN 120	Digital Logic Design	3	0	3
5	None	CEL 120	Digital Logic Design Lab	0	1	1
6	None	EEL 113	Engineering Workshop	0	1	1
7	CEN 120	CEN 440	Embedded Systems Design	3	0	3
8	CEN 120	CEL 440	Embedded Systems Design Lab	0	1	1
9	AIC 201	RIS 364	Machine Learning	3	0	3
10	AIC 201	RIL 364	Machine Learning Lab	0	1	1
11	None	RIS 231	Introduction to Robotics	3	0	3
12	None	RIL 231	Introduction to Robotics Lab	0	1	1
13	GSC 220	EEN 412	Linear Control System	3	0	3
14	GSC 220	EEL 412	Linear Control System Lab	0	1	1
15	None	RIS 241	Sensors & Actuators	3	0	3
16	None	RIL 241	Sensors & Actuators Lab	0	1	1
17	CSC 210	RIS 361	Robotic System &Programing	3	0	3
18	CSC 210	RIL 361	Robotic System &Programing Lab	0	1	1
19	CSC 210	AIC 201	Artificial Intelligence	3	0	3
20	CSC 210	AIL 201	Artificial Intelligence Lab	0	1	1
21	EEN 412	RIS 362	Robot Modeling & Control	3	0	3
22	EEN 412	RIL 362	Robot Modeling & Control Lab	0	1	1
23	AIC 301	RIS 474	Introduction to Deep Learning	3	0	3
24	AIC 301	RIL 474	Introduction to Deep Learning Lab	0	1	1
25	CSC 113	RIS 363	Internet of things (IoT)	3	0	3
26	CSC 113	CSC 210	Object Oriented Programming	3	0	3
27	CSC 113	CSL 210	Object Oriented Programming Lab	0	1	1
28	None	CSC 113	Computer Programming	3	3	3

29	None	CSL 113	Computer Programming Lab	1	0	1
30	None	EEL 121	Engineering Drawing & CAD	1	0	1

Robotics & Intelligent Systems Elective Courses (5 courses 17 credit hours)

Sr. No	Pre-req	Course Code	Course Title	Theory	Lab	CR
1	CSC 113	RIS 363	Internet of things (IoT)	3	3	0
2	RIS 241	RIS 482	Introduction to Haptics	3	0	3
3	RIS 362	RIS 483	Introduction to Humanoid Robots	3	0	3
4	RIS 362	RIS 484	Advanced Modelling of Robotics	3	0	3
5	GSC 123	RIS 485	Optimal Kinematic Design of Robots	3	0	3
6	RIS 361	RIS 486	Distributive Robotics/Swarm Robotics	3	0	3
7	None	CSC 410	Introduction to Cloud Computing	3	0	3
8	GSC 113	RIS 489	Mechanics of Materials	3	0	3
9	RIS 231	RIS 486	Swarm Robotics	3	0	3
10	None	RIS 471	Robot Process Automation	3	0	3
11	None	RIS 471	Robot Process Automation Lab	0	1	1
12	None	RIS 473	Introduction to R Programming	3	0	3
13	None	RIL 473	Introduction to R Programming Lab	0	1	1
14	CEN 444	CSC 464	Computer Vision	3	0	3
15	CEN 444	CSL 464	Computer Vision Lab	0	1	1
16	AIC 201	RIS 475	Human Robot Interaction	3	0	3
17	AIC 201	RIL 475	Human Robot Interaction Lab	0	1	1
18	AIC 201	RIS 476	Artificial Neural Network	3	0	3
19	AIC 201	RIL 476	Artificial Neural Network Lab	0	1	1
20	AIC 201	RIS 487	AI for Computer Games	3	0	3
21	AIC 201	RIL 487	AI for Computer Games Lab	0	1	1
22	AIC 301	RIS 488	Chatbots	3	0	3
23	AIC 301	RIL 488	Chatbots Lab	0	1	1

BS Artificial Intelligence

CURRICULUM DOCUMENT

DEPARTMENT OF COMPUTER SCIENCE, BAHRIA UNIVERSITY

Conformance with HEC UG Policy

Program	TC H	CH limit	Gen Ed	Major/ Disc	Interdisciplinary/ Allied	Field/ Internship	Capstone project	Addtnl Major	Ad entry/Exit
BSAI	133	130-136	Yes 30 CH	Yes 85 CH	Yes 12 CH (Called as mathematics and supporting courses)	Yes (Graded non-credited)	Yes (6 CH)	No	BU does not offer AD in AI. Can be added in future by introducing ADP Program in AI. In current form exit is possible as all GE are covered in first 4 semesters and total credit hours in first 4 semesters are more than 60 and less than 72.

Note[1]: The roadmap of BS AI has been developed based on NCEAC Curriculum of Undergraduate Degree Programs of Computing Disciplines (Revised 2023). The curriculum of BSAI Programs was approved in 43rd ACM and mostly aligned with HEC UG policy as shown above. However, in its present form it does not cover the aspect of completing general education in first 4 semesters. New semester wise course plan has been discussed in FBoS and is presented below for approval. The changes in course offering are highlighted in red color.

Note[2]: The list of General education and other categories are already given in appendage 4307 C of the minutes of 43rd ACM, hence, not repeated here.

Program Roadmap

SEMESTER 1							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	None	GSC 114	Applied Physics	2	0	2	**17**
	None	GSL 114	Applied Physics Lab	0	1	1	
2.	None	CSC 114	Introduction to Information & Communication Technology	2	0	2	

3.	None	CSL 114	Introduction to Information & Communication Technology Lab	0	1	1	
4.	None	CSC 113	Computer Programming	3	0	3	
5.	None	CSL 113	Computer Programming Lab	0	1	1	
6.	None	GSC 221	Discrete Mathematics	3	0	3	
7.	None	ISL101	Islamic Studies	2	0	2	
8.	None	CSC 307	Professional Practices and Ethics	2	0	2	
9	None	ISL 107	Tajweed	Non-Credited 1 hour per week	0	0	

SEMESTER 2							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	None	CEN 120	Digital Design	2	0	2	
2.	None	CEL 120	Digital Design Lab	0	1	1	
3.	CSC 113	CSC 210	Object Oriented Programming	3	0	3	
4.	CSC 113	CSL 210	Object Oriented Programming Lab	0	1	1	**18**
5.	None	GSC 122	Probability and Statistics	3	0	3	
6.	None	GSC 110	Applied Calculus and Analytical Geometry	3	0	3	
7.	None	ENG 101	Functional English	3	0	3	
8.	None	PAK 101	Pakistan Studies	2	0	2	
9	None	ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0	0	

SEMESTER 3							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	CEN 120	CEN 325	Computer Organization& Assembly Language	2	0	2	
2.	CEN 120	CEL 325	Computer Organization& Assembly Language Lab	0	1	1	
3.	CSC 113	CSC 221	Data Structures and Algorithms	3	0	3	
4.	CSC 113	CSL 221	Data Structures and Algorithms Lab	0	1	1	**17**
5.	AIC 201	AIC 202	Programming for Artificial Intelligence	2	0	2	
6.	AIC 201	AIL 202	Programming for Artificial Intelligence Lab	0	1	1	
7.	None	GSC 121	Linear Algebra	3	0	3	
8.	None	ENG134	Communication Skills	2	0	2	
9.	None	HSS 217	Introduction to Sociology	2	0	2	
10	ISL 108	ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0	0	

SEMESTER 4							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	None	CEN 222	Data Communication and Networking	3	0	3	**17**
2.	None	CEL 222	Data Communication and Networking Lab	0	1	1	
3.	CSC 210	AIC 201	Artificial Intelligence	3	0	3	
4.	CSC 210	AIL 201	Artificial Intelligence Lab	0	1	1	
5.	None	CSC 220	Database Management Systems	3	0	3	
6.	None	CSL 220	Database Management Systems Lab	0	1	1	
7.	None	HSS423	Entrepreneurship	2	0	2	
8.			Social Sciences Elective	3	0	3	
9	ISL 109	ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0	0	

SEMESTER 5							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	AIC 201	AIC 203	Knowledge Representation & Reasoning	3	0	3	**18**
2.	AIC 201	AIC 301	Machine Learning	2	0	2	
3.	AIC 201	AIL 301	Machine Learning Lab	0	1	1	
4.	GSC 110	GSC 211	Multivariable Calculus	3	0	3	
5.	CSC 221	CSC 321	Design and Analysis of Algorithms	3	0	3	
6.			Domain Elective 1 (2+1)	2	1	3	
7.			Domain Elective 2 (3+0 or 2+1)	3/2	0/1	3	
8	ISL 110	ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0	0	

SEMESTER 6							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	AIC 301	AIC 401	Deep Learning	2	0	2	**16**
2.	AIC 301	AIL 401	Deep Learning Lab	1	0	1	
3.	CSC 221	CSC 320	Operating Systems	3	0	3	
4.	CSC 221	CSL 320	Operating Systems Lab	0	1	1	
5.	CSC 320	AIC 302	Parallel & Distributed Computing	2	0	2	
6.	CSC 320	AIL 302	Parallel & Distributed Computing Lab	0	1	1	
7.			Domain Elective 3 (2+1)	2	1	3	
8.			Elective 4 (3+0 or 2+1)	3/2	0/1	3	
9	ISL 111	ISL 112	Understanding Quran-v	Non credited 1 hour	0	0	

				every week			

SEMESTER 7							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	None	FYP 400	Final Year Project	0	3	3	**15**
2.	None	SEN 220	Software Engineering	3	0	3	
3.	None	AIC 304	Computer Vision	2	0	2	
4.	None	AIL 304	Computer Vision Lab	0	1	1	
5.	HSS 120	HSS 320	Technical Writing & Presentation Skills	3	0	3	
6.			Elective 5 (2+1)	2	1	3	
7	None	ISL 113	Seerah-i	Non credited 1 hour every week	0	0	

SEMESTER 8							
S No.	**Pre-Req**	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
1.	None	FYP 400	Final Year Project	0	3	3	**15**
2.	CEN 222	CSC 407	Information Security	3	0	3	
3.			Elective Supporting	3	0	3	
4.			Domain Elective 6 (2+1)	2	1	3	
5.			Domain Elective 7 (3+0 or 2+1)	3/2	0/1	3	
6	ISL 113	ISL 114	Seerah-ii	Non credited 1 hour every week	0	0	
						Total	**133**

BS Computer Science

CURRICULUM DOCUMENT

DEPARTMENT OF COMPUTER SCIENCE, BAHRIA UNIVERSITY

Conformance with HEC UG Policy

Program	TCH	CH limit	Gen Ed	Major/ Disc	Interdisciplinary/ Allied	Field/ Internship	Capstone project	Addtnl Major	Ad entry/Exit
BSAI	133	130-136	Yes 30 CH	Yes 85 CH	Yes 12 CH (Called as mathematics and supporting courses)	Yes (Graded non-credited)	Yes (6 CH)	No	BU offers AD in CS. The 4 semesters of AD in CS is not exactly the same as first 4 semester of BSCS. Hence, a candidate desired to enter in BSCS has to align with BSCS program at the time of entry. Similarly to exit a student has to take deficient courses to receive AD certificate.

Note[1]: The roadmap of BS CS has been developed based on NCEAC Curriculum of Undergraduate Degree Programs of Computing Disciplines (Revised 2023). The curriculum of BSCS Programs was approved in 43rd ACM and mostly aligned with HEC UG policy as shown above. However, in its present form it does not cover the aspect of completing general education in the first 4 semesters. A new semester wise course plan has been discussed in FBoS and is presented below for approval. The changes in course offering are highlighted in red color.

Note[2]: The list of General education and other categories are already given in appendage 4307 A of the minutes of 43rd ACM, hence, not repeated here.

Program Roadmap

SEMESTER 1						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	GSC 114	Applied Physics	2	0	2	17
None	GSL 114	Applied Physics Lab	0	1	1	
None	CSC 114	Introduction to Information & Communication Technology	2	0	2	
None	CSL 114	Introduction to Information & Communication Technology Lab	0	1	1	
None	CSC 113	Computer Programming	3	0	3	
None	CSL 113	Computer Programming Lab	0	1	1	

None	GSC 221	Discrete Mathematics	3	0	3	
None	ISL 101	Islamic Studies/Ethics	2	0	2	
None	CSC 308	Professional Practices & Ethics	2	0	2	
None	ISL 107	Tajweed	Non-Credited 1 hour per week	0	0	
SEMESTER 2						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	GSC 122	Probability and Statistics	3	0	3	18
CSC 113	CSC 210	Object Oriented Programming	3	0	3	
CSC 113	CSL 210	Object Oriented Programming Lab	0	1	1	
GSC 114	CEN 122	Digital Design	2	0	2	
GSC 114	CEL 122	Digital Design Lab	0	1	1	
None	GSC 110	Applied Calculus and Analytical Geometry	3	0	3	
None	ENG 101	Functional English	3	0	3	
None	PAK 101	Pakistan Studies	2	0	2	
None	ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0	0	
SEMESTER 3						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	HSS 217	Introduction to Sociology	2	0	2	18
None	GSC 121	Linear Algebra	3	0	3	
GSC 110	GSC 211	Multivariable Calculus	3	0	3	
None	CEN 223	Computer Communication & Networks	3	0	3	
None	CEL 223	Computer Communication & Networks Lab	0	1	1	
CSC 113	CSC 221	Data Structure & Algorithm	3	0	3	
CSC 113	CSL 221	Data Structure & Algorithm Lab	0	1	1	
None	ENG 134	Communication Skills	2	0	2	
ISL 108	ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0	0	
SEMESTER 4						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None		Social Sciences Elective	3	0	3	

CEN 122	CEN 323	Computer Organization and Assembly Language	2	0	2	
CEN 122	CEL 323	Computer Organization & Assembly Language Lab	0	1	1	18
None	ENG 320	Technical writing and Presentation skills	3	0	3	
None	CSC 220	Database Management Systems	3	0	3	
None	CSL 220	Database Management Systems Lab	0	1	1	
None	HSS 423	Entrepreneurship	2	0	2	
SEN 220	SEN 321	Human Computer Interaction	2	0	2	
SEN 220	SEL 321	Human Computer Interaction Lab	0	1	1	
ISL 109	ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0	0	

SEMESTER 5

Prerequisite	Course Code	Course Title	Theory	Lab	CR	CR/Sem
CSC 221	CSC 320	Operating Systems	3	0	3	17
CSC 221	CSL 320	Operating Systems Lab	0	1	1	
None	CSC 315	Theory of Automata	3	0	3	
CSC 221	CSC 321	Design and Analysis of Algorithms	3	0	3	
CEN 323	CSC 327	Computer Architecture	2	0	2	
CEN 323	CSL 327	Computer Architecture Lab	0	1	1	
None	CSC 325	Artificial Intelligence	3	0	3	
None	CSL 325	Artificial Intelligence Lab	0	1	1	
ISL 110	ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0	0	

SEMESTER 6

Prerequisite	Course Code	Course Title	Theory	Lab	CR	CR/Sem
CSC 315	CSC 323	Compiler Construction	2	0	2	15
CSC 315	CSL 323	Compiler Construction Lab	0	1	1	
		Elective 1 (2+1)	2	1	3	
		Elective 2 (2+1)	2	1	3	
		Elective 3 (3+0 or 2+1)	3/2	0/1	3	
None	SEN 220	Software Engineering	3	0	3	
ISL 111	ISL 112	Understanding Quran-v	Non credited 1 hour every week	0	0	

SEMESTER 7						
Prerequisite	**Course code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	FYP 400	Final Year Project	0	3	3	15
CSC 220	CSC 470	Advanced Databases	2	0	2	
CSC 220	CSL 470	Advanced Databases Lab	0	1	1	
		Elective Supporting Course	3	0	3	
		Elective 4 (2+1)	2	1	3	
		Elective 5 (2+1)	2	1	3	
None	ISL 113	Seerah-i	Non credited 1 hour every week	0	0	
SEMESTER 8						
Prerequisite	**Course code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	FYP 400	Final Year Project	0	3	3	15
None	CSC 407	Information Security	3	0	3	
CSC 320	AIC 302	Parallel & Distributed Computing	2	0	2	
CSC 320	AIL 302	Parallel & Distributed Computing Lab	0	1	1	
		Elective 6 (2+1)	2	1	3	
		Elective 7 (3+0 or 2+1)	3/2	0/1	3	
ISL 113	ISL 114	Seerah-ii	Non credited 1 hour every week	0	0	
					Total Credit Hours	**133**

BS Information Technology

CURRICULUM DOCUMENT

DEPARTMENT OF COMPUTER SCIENCE, BAHRIA UNIVERSITY

Conformance with HEC UG Policy

Program	TCH	CH limit	Gen Ed	Major/ Disc	Interdisciplinary/ Allied	Field/ Internship	Capstone project	Addtnl Major	Ad entry/Exit

BSAI	133	130-136	Yes 30 CH	Yes 85 CH	Yes 12 CH (Called as mathematics and supporting courses)	Yes (Graded non-credited)	Yes (6 CH)	No	BU does not offer AD in IT. Can be added in future by introducing ADP Program in IT. In current form exit is possible as all GE are covered in first 4 semesters and total credit hours in first 4 semesters are more than 60 and less than 72.

Note[1]: The roadmap of BS IT has been developed based on NCEAC Curriculum of Undergraduate Degree Programs of Computing Disciplines (Revised 2023). The curriculum of BSIT Programs was approved in 43rd ACM and mostly aligned with HEC UG policy as shown above. However, in its present form it does not cover the aspect of completing general education in the first 4 semesters. A new semester wise course plan has been discussed in FBoS and is presented below for approval. The changes in course offering are highlighted in red color.

Note[2]: The list of General education and other categories are already given in appendage 4307 B of the minutes of 43rd ACM, hence, not repeated here.

Program Roadmap

Semester 1						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	CSC 114	Introduction to Information & Communication Technology	2	0	2	17
None	CSL 114	Introduction to Information & Communication Technology Lab	0	1	1	
None	CSC 113	Computer Programming	3	0	3	
None	CSL 113	Computer Programming Lab	0	1	1	
None	GSC 114	Applied Physics	2	0	2	
None	GSL 114	Applied Physics Lab	0	1	1	
None	ISL101	Islamic Studies	2	0	2	
None	GSC 221	Discrete Mathematics	3	0	3	
None	CSC308	Professional Practices and Ethics	2	0	2	
None	ISL 107	Tajweed	Non-Credited 1 hour per week	0	0	
Semester 2						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
CSC 113	CSC 210	Object Oriented Programming	3	0	3	18
CSC 113	CSL 210	Object Oriented Programming Lab	0	1	1	
GSC 114	CEN 122	Digital Design	2	0	2	
GSC 114	CEL 122	Digital Design Lab	0	1	1	
None	GSC 110	Applied Calculus and Analytical Geometry	3	0	3	
None	GSC 122	Probability and Statistics	3	0	3	
None	PAK101	Pakistan Studies	2	0	2	
None	ENG 105	Functional English	3	0	3	
None	ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0	0	
Semester 3						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
CSC 113	CSC 221	Data Structure & Algorithm	3	0	3	18
CSC 113	CSL 221	Data Structure & Algorithm Lab	0	1	1	
None	SEN220	Software Engineering	3	0	3	

None	CEN 223	Computer Communication & Networks	3	0	3	
None	CEL 223	Computer Communication & Networks Lab	0	1	1	
None	GSC 121	Linear Algebra	3	0	3	
None	HSS 217	Introduction to Sociology	2	0	2	
None	ENG134	Communication Skills	2	0	2	
ISL 108	ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0	0	

Semester 4

Prerequisite	Course Code	Course Title	Theory	Lab	CR	CR/Sem
CSC210	ITC226	Web Systems and Technologies	2	0	2	
CSC210	ITL226	Web Systems and Technologies Lab	0	1	1	
CSC 221	CSC 321	Design and Analysis of Algorithms	3	0	3	
None	HSS423	Entrepreneurship	2	0	2	
HSS 118	HSS 320	Technical Writing & Presentation Skills	3	0	3	17
GSC 110	GSC 211	Multivariable Calculus	3	0	3	
None		Social Sciences Elective	3	0	3	
ISL 109	ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0	0	

Semester 5

Prerequisite	Course Code	Course Title	Theory	Lab	CR	CR/Sem
None	CSC220	Database Management System	3	0	3	
None	CSL220	Database Management System Lab	0	1	1	
CSC 221	CSC 320	Operating Systems	3	0	3	
CSC 221	CSL 320	Operating Systems Lab	0	1	1	
CEN223	ITC312	System and Network Administration	3	0	3	
CEN223	ITL312	System and Network Administration Lab	0	1	1	18
ITC312	ITC324	Information Technology Infrastructure	3	0	3	
CEN 223	CSC 407	Information Security	3	0	3	
ISL 110	ISL 111	Understanding Quran-iv	Non credited 1 hour	0	0	

			every week			

Semester 6

Prerequisite	Course Code	Course Title	Theory	Lab	CR	CR/Sem
CEN 122	CEN323	Computer Organization and Assembly Language	2	0	2	15
CEN 122	CEL323	Computer Organization and Assembly Language	0	1	1	
CSC 210	CSC411	Artificial Intelligence	2	0	2	
CSC 210	CSL411	Artificial Intelligence Lab	0	1	1	
		Domain Elective 1 (2+1)	2	1	3	
		Domain Elective 2 (2+1)	2	1	3	
		Domain Elective 3 (3+0 or 2+1)	3/2	0/1	3	
ISL 111	ISL 112	Understanding Quran-v	Non credited 1 hour every week	0	0	

Semester 7

Prerequisite	Course code	Course Title	Theory	Lab	CR	CR/Sem
CSC220	ITC327	Database Administration and Management	2	0	2	15
CSC220	ITL327	Database Administration and Management Lab	0	1	1	
None	FYP 400	Final Year Project	0	3	3	
CEN223	ITC411	Cyber Security	3	0	3	
		Domain Elective 4 (2+1)	2	1	3	
		Domain Elective 5 (3+0 or 2+1)	3/2	0/1	3	
None	ISL 113	Seerah-i	Non credited 1 hour every week	0	0	None

Semester 8

Prerequisite	Course code	Course Title	Theory	Lab	CR	CR/Sem
None	FYP 400	Final Year Project	0	3	3	15
CSC320	AIC302	Parallel and Distributed Computing	2	0	2	
CSC320	AIL302	Parallel and Distributed Computing Lab	0	1	1	
		Elective Supporting	3	0	3	

		Domain Elective 6 (3+0 or 2+1)	3/2	0/1	3	
		Domain Elective 7 (3+0 or 2+1)	3/2	0/1	3	
ISL 113	ISL 114	Seerah-ii	Non credited 1 hour every week	0	0	
				Total Credit Hours		**133**

Bachelor Programs of Earth & Environmental Sciences Department

Curriculum
2023

Department of Earth & Environmental Sciences
BAHRIA UNIVERSITY
ISLAMABAD CAMPUS

Bachelor of Science (BS) Environmental Sciences
Proposed Roadmap as Per HEC 2023 Undergraduate Policy

Program Educational Objectives (PEOS)

1. **PEO-1:** Function successfully in a professional environment by utilizing and enhancing their problem-solving and communication skills.
2. **PEO-2:** Continued learning through advanced professional education or through certifications whenever possible.
3. **PEO-3:** Promote organizational success with efficient leadership skills, and demonstrate ethical and societal awareness, while practicing and promoting professional behavior towards a sustainable environment.

Program Learning Outcomes (PLOS)

1. **PLO-1 Scientific Knowledge:** Ability to apply fundamental knowledge of environmental sciences to the solution of complex environmental problems.

2. **PLO-2 Problem Analysis:** Ability to identify, formulate, research literature, and analyze complex environmental problems reaching verified conclusions.

3. **PLO-3 Design and Development**: Ability to design solutions for complex environmental problems and design systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4. **PLO-4 Investigation:** Ability to investigate complex environmental problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
5. **PLO-5 Modern Tool Usage:** Ability to create, select and apply appropriate techniques, resources, and modern environmental and IT tools for solutions of environmental problems.
6. **PLO-6 Sustainable Development:** Ability to understand the impact of professional environmental solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
7. **PLO-7 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of environmental practice.

Mapping of PLOs to PEOs

No	Program Learning Outcomes (PLOs)	PEOs		
		PEO1	PEO-2	PEO-3
1.	Scientific Knowledge	✓	✓	
2.	Problem Analysis:	✓		
3.	Design and Development	✓		
4.	Investigation	✓		

5.	Modern Tool Usage	✓	✓	
6.	Sustainable Development		✓	✓
7.	Ethics		✓	✓

BS Environmental Sciences PROPOSED ROADMAP

HEC UG Policy				**Existing ES Road Map**		**Proposed ES Road Map**	
		CH	**Courses**	Credit Hours	Courses	Credit Hours	Courses
General Education	Natural Sciences	3	1	6	2	6	2
	Social Sciences	2	1	6	2	2	1
	Arts and Humanities	2	1	0	0	2	1
	Expository Writing	3	1	6	2	3	1
	Functional English	3	1	3	1	3	1
	Quantitative Reasoning	6	2	6	2	6	2
	Ideology and Const. of Pak	2	1	2	1	2	1
	Islamiat	2	1	2	1	2	1
	Application of ICT	2+1	1	0	0	2+1	1
	Entrepreneurship	2	1	0	0	2	1
	Civics and Comm. Engage	2	1	0	0	2	1
	Total	30	12	31	11	33	12
Major	Diff. Courses	72	As per req.	92	31	81	25
Int. Disciplinary	Diff. Courses	12	4	3	2	12	4
Capstone Project	Thesis	3	NA	6	1	3	1
Field Experience/ Internship	Field Visit	3	NA	3	1	3	1
	Total	120		135		132	

SUMMARY

HEC GUIDELINES	**HEC UG POLICY 2023**	**PROPOSED ROADMAP**
General Education Course: 13	30 Credit Hours	**33 Credit hours**
Major (Disciplinary) Requirements	Minimum 72 Credit Hours	**81 Credit Hours**
Interdisciplinary/allied courses: 04	12 Credit Hours	**12 Credit Hours**
Field Work Course: 01	3 Credit Hours	**03 Credit Hours**
Capstone Project: 01	3 Credit Hours	**03 Credit Hours**
Total	120-144 Credit Hours	**132 Credit Hours**

Semester 1											
Existing Courses						**New Roadmap as per HEC 2023 Policy**					
Sr#	**Pre Req.**	**Course Code**	**Existing Course Title**	**Credit Hour**		**Course Code**	**Proposed**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1		ENG 103	English-I	3	0	ENG 105	Functional English	3	0	General Education Course (Functional English)	Change of Course Title
2		PHY 101	Physics	3	0	PHY 101	Physics	2	1	General Education Course (Natural Sciences)	1 CH for lab Added, c
						PHL 103	Physics Lab				
3		CSC 105	Introduction to Computers	3	0	CSC 102	Introduction to Computers & Programming	2	1	General Education Course (Quantitative Reasoning)	Changed from Introduction to Computers (CSC 105)
						CSL 102	Introduction to computers & Programming lab				
4		PAK 101	Pakistan Studies	2	0	-	Ideology & Constitution of Pakistan	2	0	General Education Course (Ideology & Constitution of Pakistan)	New Course added
5		ENV 105	Introduction to Environmental Sciences	3	0	ENV 105	Introduction to Environmental Sciences	3	0	Major (Disciplinary) Requirements	Moved from semester 2 to 1
6		ISL 102	Islamic Studies	2	0	ISL 102	Islamic Studies	2	0	General Education Course (Islamic studies)	No Change
7		MAT 105/BIO 105	Fundamentals of Mathematics/Fundamentals of Biology	0	0	MAT 105/BIO 105	Mathematics/Biology	0	0	Zero Credit Course (1 zero credit course for Math/Biology course for students with Pre Medical background)	No Change

8						ISL 107	Tajweed	Non-Credited 1 hour per week	0		
							Total Credit Hours	**16**			

Semester 2

Existing Courses						**New Roadmap as per HEC 2023 Policy**					
Sr#		**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Proposed**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1		ENG 104	English -II	3	0	HSS 320	Technical Writing and Presentation Skills	3	0	General Education Course (Expository Writing)	Change of Course Title
2		CHM 105	Chemistry	3	0	CHM 105 CHL 105	Chemistry Chemistry Lab	2	1	General Education Course (Natural Sciences)	1 CH for lab Added, Course contents modified
3		HSS 107	Introduction to Psychology	3	0	MAT 205	Statistics	3	0	General Education Course (Quantitative Reasoning)	Moved from semester 3
4		ENV 110	Environmental Biology	3	0	ENV 110	Environmental Biology	3	0	Major (Disciplinary) Requirements	No Change
5		GEO 110	Fundamental of Geography & Geomorphology	3	0	GEO 110	Fundamental of Geography & Geomorphology	3	0	Interdisciplinary/allied courses	No Change
6						ENV 230	Environmental Issues	3	0	Major (Disciplinary) Requirements	Moved from semester 3
						ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0		

							Total Credit Hours			**18**	
Semester 3											
Existing Courses						**New Roadmap as per HEC 2023 Policy**					
Sr#	**Pre Req**	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1						GEO 201	Museology	2	0	General Education Course (Arts and Humanities)	New Course added
2	CHM 105 Chemistry	ENV 210	Environmental Chemistry	3	0	ENV 210 ENL 210	Environmental Chemistry Environmental Chemistry Lab	2	1	Major (Disciplinary) Requirements	1 CH for lab Added Moved from semester 4, Course contents modified
3		ENV 230	Environmental Issues	3	0	ENV 215	Social Theory of Environment	3	0	Major (Disciplinary) Requirements	Moved from semester 4
4		ENV 205	Fundamentals of Ecology	3	0	ENV 205	Fundamentals of Ecology	3	0	Major (Disciplinary) Requirements	No Change
5		MAT 205	Statistics	3	0	PSY 102	Introduction to Psychology	2	0	General Education Course (Social Sciences)	Moved from semester 4, 1 CH reduced
6						ENV 220 ENL 220	Environmental Microbiology Environmental Microbiology Lab	2	1	Major (Disciplinary) Requirements	1 CH for lab Added. Moved from semester 4, Course contents modified
7							Civics and Community Engagement	2	0	General Education Course (Civics and Community Engagement)	New course added
8						ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0		
							Total Credit Hours	**18**			

Semester 4

Existing Courses						New Roadmap as per HEC 2023 Policy					
Sr#	**Pre Req**	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1							Entrepreneurship	2	0	General Education Course (Entrepreneurship)	New course added
2	ENV 105 Intro to ES	ENV 215	Social Theory of Environment	3	0	ENV 236	Introduction to Climate Change	3	0	Major (Disciplinary) Requirements	New Course added
3	ENV 110 Env. Bio	ENV 220	Environmental Microbiology	3	0		Application of Information and Communication Technologies	2	1	General Education Course (Applications of Information and Communication Technologies (ICT)	New course added
							Application of Information and Communication Technologies Lab				
4		GEO 305	Environmental Geology	3	0	ENV 315	Environmental Management System	3	0	Major (Disciplinary) Requirements	Moved from semester 5
5		ENV 305	Environmental Monitoring	3	0	ENV 305	Environmental Monitoring	2	1	Major (Disciplinary) Requirements	1 CH for lab Added Moved from semester 5, Course contents modified
						ENL 305	Environmental Monitoring Lab				
6		ENV 310	Environmental Toxicology	3	0	ENV 310	Environmental Toxicology	3	0	Major (Disciplinary) Requirements	Existing
						ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0		
							Total Credit Hours	**17**			

Semester 5

Existing Courses						New Roadmap as per HEC 2023 Policy				
Sr#	**Pre Req**	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1	ENV 220 Env. Microbiology	ENV 320	Environmental Biotechnology	3	0	ENV 320	Environmental Biotechnology	3	0	Major (Disciplinary) Requirements	No Change
2		ENV 335	Analytical Techniques in Environmental Sciences	3	0	ENV 335	Analytical Techniques in Environmental Sciences	2	1	Major (Disciplinary) Requirements	1 CH for lab Added, Course contents modified
						ENL 335	Analytical Techniques in Environmental Sciences Lab				
3		ENV 315	Environmental Management System	3	0	GEO 305	Environmental Geology	3	0	Interdisciplinary/allied courses	Moved from semester 4
4		ENV 325	Environmental Engineering	3	0	ENV 325	Environmental Engineering	3	0	Major (Disciplinary) Requirements	Moved from semester 6
5		ENV 340	Solid Waste Management	3	0	ENV 330	Environmental & Natural Resource Economics	3	0	Major (Disciplinary) Requirements	Moved from semester 6
6		GEO 351	Natural Disaster Management	3	0	GEO 351	Natural Disaster Management	3	0	Major (Disciplinary) Requirements	Moved from Electives
						ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0		
							Total Credit Hours	**18**			

Semester 6

Existing Courses						New Roadmap as per HEC 2023 Policy					
Sr#	**Pre Req**	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1		ENV 345	Environmental Hazard & Management	3	0	ENV 345	Environmental Hazard & Management	3	0	Major (Disciplinary) Requirements	Moved from semester 7
2		ENV 330	Environmental & Natural Resource Economics	3	0	ENV 340 ENL 340	Solid Waste Management Solid Waste Management Lab	2	1	Major (Disciplinary) Requirements	Moved from semester 5, 1 CH added for Lab, Course contents modified
3		ENV 415	Natural Resource Management	3	0	ENV 361	Natural Resource Management	3	0	Major (Disciplinary) Requirements	Existing, Course code changed
4		ENV 405	Pollution Control Technology	3	0						
5			Elective-I	3	0	ENV 355	Urban Environmental Management	3	0	Major (Disciplinary) Requirements	New Course Added
6		ENV 240	Environmental Sciences Field Work and Report I	3	0	ENV 351	Environmental Sciences Field Work	0	3	Major (Disciplinary) Requirements	Moved from Summer Semester, Course name and course code changed
						ISL 112	Understanding Quran-v	Non credited 1 hour every week	0		
							Total Credit Hours	**15**			

Semester 7											
Existing Courses						**New Roadmap as per HEC 2023 Policy**					
Sr#	**Pre Req**	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
				Theory	**Lab**			**Theory**	**Lab**		
1		ENV 410	Environmental Impact Assessment	2	0	ENV 410	Environmental Impact Assessment	3	0	Major (Disciplinary) Requirements	No Change
2		ENV 420	Research Methods in Environmental Sciences	3	0	ENV 420	Research Methods in Environmental Sciences	3	0	Major (Disciplinary) Requirements	1 CH added
3		GEO 420	Hydrogeology	3	0	GEO 420	Hydrogeology	3	0	Interdisciplinary/allied courses	No Change
4	ENV 415 Natural Resource Management		Elective-II	3	0	ENV 461	Water Resources Management	3	0	Major (Disciplinary) Requirements	New Course added, Course Code Changed
5						ISL 113	Seerah-i	Non credited 1 hour every week	0		
6						GEO 437	GIS & Remote Sensing	2	1	Interdisciplinary/allied courses	1 CH for lab Added Moved from semester 6, Course contents modified
						GEL 437	GIS & Remote Sensing Lab				
							Total Credit Hours	**15**			

Semester 8

Existing Courses					New Roadmap as per HEC 2023 Policy					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 435	GIS & Remote Sensing	3	0	ENV 405	Pollution Control Technology	3	0	Major (Disciplinary) Requirements	Moved from semester 7
2	ENV 425	Occupational Health & Safety	3	0	ENV 425	Occupational Health & Safety	3	0	Major (Disciplinary) Requirements	Existing
3	ENV 440	Energy and Environment	3	0	ENV 440	Energy and Environment	2	1	Major (Disciplinary) Requirements	1 CH for lab Added, Course contents modified
					ENL 440	Energy and Environment Lab				
4	ENV 430	Environmental Policies & Laws	3	0	ENV 430	Environmental Policies & Laws	3	0	Major (Disciplinary) Requirements	No Change
5	ENV 435	Thesis	0	6	ENV 435	Thesis / Capstone Project	0	3	Capstone Project	3 CH reduced
					ISL 114	Seerah-ii	Non credited 1 hour every week	0		
						Total Credit Hours	**15**			

Course Description

Course Description of General Education and Foundation Courses for BS Environmental Sciences Program

XX Ideology and Constitution of Pakistan (2 CH)
Historical background of Pakistan: Muslim society in Indo-Pakistan, the movement led by the societies, the downfall of Islamic society, the establishment of British Raj- Causes and consequences. Political evolution of Muslims in the twentieth century: Sir Syed Ahmed Khan; Muslim League; Nehru; Allama Iqbal: Independence Movement; Lahore Resolution; Pakistan culture and society, Constitutional and Administrative issues, Pakistan and its geopolitical dimension, Pakistan and International Affairs, Pakistan and the challenges ahead.

CHM 105 Chemistry (2 CH)
Periodic Table, chemical bonding: ionic, covalent, coordinate covalent bond.Solution chemistry. Surface chemistry. Colloids chemistry. Thermodynamics and chemical kinetics. General chemistry of functional groups of organic compounds (alcohols, carbonyls, esters, carboxylic acids, amines). Aromatic compounds, ions, radicals. Photochemical reactions. Radioactivity. Weak Acids & Bases; Water Hardness; Redox Reactions, Chemical Kinetics; Radioactivity.

CHL 105 Chemistry Lab (1 CH)
Preparation of molar, molal, normal solutions and buffers. Osmosis and Diffusion. Measurement of pH, EC, DO and TDS in waste water. Use of titrimetric and gravimetric analysis. Use of spectrophotometric techniques. Paper Chromatography (one and two dimensional)

XX Applications of Information and Communication Technologies (ICT) (2 CH)
Brief history of Computer, Four Stages of History, Computer Elements, Processor, Memory, Hardware, Software, Application Software its uses and Limitations, System Software its Importance and its Types, Types of Computer (Super, Mainframe, Mini and Micro Computer), Introduction to CBIS (Computer Based Information System), Methods of Input and Processing, Class2. Organizing Computer Facility, Centralized Computing Facility, Distributed Computing Facility, Decentralized Computing Facility, Input Devices. Keyboard and its Types, Terminal (Dump, Smart, Intelligent), Dedicated Data Entry, SDA (Source Data Automation), Pointing Devices, Voice Input, Output Devices. Soft- Hard Copies, Monitors and its Types, Printers and its Types, Plotters, Computer Virus and its Forms, Storage Units, Primary and Secondary Memories, RAM and its Types, Cache, Hard Disks, Working of Hard Disk, Diskettes, RAID, Optical Disk Storages (DVD, CD ROM), Magnetic Types, Backup System, Data Communications, Data Communication Model, Data Transmission, Digital and Analog Transmission, Modems, Asynchronous and Synchronous Transmission, Simplex. Half Duplex, Full Duplex Transmission, Communications, Medias (Cables, Wireless), Protocols, Network Topologies (Star, Bus, Ring), LAN, LAN, Internet, A Brief History, Birthplace of ARPA Net, Web Link, Browser, Internet Services provider and Online Services Providers, Function and Features of Browser, Search Engines, Some Common Services available on Internet.

XX Applications of Information and Communication Technologies Lab (ICT) (1 CH)
Practical exercises will be carried out in lab

XX Entrepreneurship (2 CH)
The Nature and Importance of Entrepreneurship: Nature and Development of Entrepreneurship; Entrepreneurial Decision Process; Role of Entrepreneurs in Economic development; Ethics and Social Responsibility of Entrepreneurship; The Future of Entrepreneurship The Entrepreneur and Entrepreneurial Mind: The Entrepreneurship process; Myths of Entrepreneurs, Managerial VS Entrepreneurial Decision Making; Entrepreneurial Leadership Characteristics The Nature and Importance of SMEs: Nature and Scope of Entrepreneurship; SMEs Definitions / Understanding by various Regulatory Authorities in Pakistan; SMEs contribution to GDP of any country, and of Pakistan; SMEDA' s Role in promoting and developing SMEs. The Individual Entrepreneur, and Techniques for Idea Generation Process; Entrepreneur VS Intrapreneur. Inside the Entrepreneurial Mind: From Ideas to reality: Creativity, Innovation and Entrepreneurship; Creativity A necessity for survival; Creative Thinking; Barriers to creativity; How to enhance creativity; The creative Process; Techniques for improving the creative process; Protecting your ideas.The Customer and Product Plan/Feasibility: Understanding of Customer through Demand and Desire, and of Product (Good and/or Service) The Industry and Marketing Plan/Feasibility: Understanding of Marketing Plan, Characteristics of Marketing Plan; and Environment Analysis and Steps in preparing the Marketing Plan The Financial Plan/Feasibility: Operating and Capital Budgets, Break Even Analysis; Cash Flows and Balance Sheets The Organizational Plan/Feasibility: Developing the management team; Building the successful Organization, The Role of BODs. Components, and Classification of Business Plans Financing Options: e.g. Leveraged Buyouts; Preparing for the new Launch; Execution & Growth; Managing early growth of the New ventures. Analysis, and Competitive Environment Analysis. Growth Options: Joint Venture; Franchising; Acquisitions; Synergy; Mergers; Hostile Takeovers; Licencing etc.

XX Civics and Community Engagement (2 CH)
This course aims to bring responsible citizenship and active engagement between Universities/HEIs (through their students) and local communities. The course will provide students with a foundational understanding of the principles, institutions, and processes of civic engagement in a democratic society. Moreover, the course will build the capacity of students as leaders and influencers by gaining fundamental understanding of leadership, citizenship, communication, advocacy, network building as well as having first-hand experience of community development through volunteer works.

ENV 210 Environmental Chemistry (2 CH)
Theory: Historical background, Introduction to Environmental Science, Technology and Chemistry, Water pollution, Water treatment, Atmosphere and atmospheric chemistry, Particles in the atmosphere, Gaseous inorganic and organic pollutants, Photo-chemical smog, Environmental chemistry of hazardous waste, Chemical analysis of Water and waste water, Waste and solid, Air and gas.

ENL 210 Environmental Chemistry Lab (1CH)

The pH and Buffer Capacity of Environmental Waters, Alkalinity of Streams and Lakes, Conductivity of Various Waters (TDS), Hydrophobic/Hydrophilic Character, Kinetics of the Decomposition of Pollutants in the Environment with an Application to Plasticizers, Introduction to Air Sampling: Particulates in Urban Air, Determination of the Concentration of Carbon Dioxide in the Atmosphere

ENV 220 Environmental Microbiology (2 CH)
Microorganisms and safety: Harmless microorganisms and assumptions, handling clinical an contaminated samples, Bio-safety against risk type microorganisms, Handling of genetically manipulated microorganisms and plant pathogens, Environmental applications: Waste water microbial treatments, solid waste treatment, biogas, sludge from fermentation as fertilizer, bio-deterioration control, bio-mining, and geological applications; Microorganisms and agri-production: bio-pesticides, dinitrogen fixation, virus detection, bacteria and virus elimination in plants, soil biological quality and plant growth, microbial activities, mineralization and immobilization, rhizosphere and degradation, Food technology and microbial aspects, Microbial food spoilage and improvement, sanitation in food industry, value addition, Industrial hygiene.

ENL 220 Environmental Microbiology Lab (1 CH)
Culturing, isolation, and identification of bacteria (culture-based) from environmental or human samples. Isolating the novel bacterial strains, microbial and molecular biological techniques.

ENV 305 Environmental Monitoring (2 CH)
Theory: Conceptual Basis of Environmental Monitoring Systems, Integrated Data Management for Environment Monitoring Programs, Basic Concept and Applications of Environmental Monitoring, Atmospheric Monitoring, Opportunities and Challenges in Surface Water Quality Monitoring, Groundwater Monitoring: Statistical Methods for Testing, Selection of Ecological Indicators for Monitoring, Efficacy of Forest Health Monitoring Indicators, Landscape Monitoring, Monitoring and Assessment of the Fate and Transport, Statistical Methods for Environmental Monitoring and Assessment, Discriminating between the Good and the Bad: Quality Assurance, Monitoring, Assessment and Environmental Policy, Development of Watershed-Based Assessment Tools, Biological Indicators in Environmental Monitoring Programs.

ENL 305 Environmental Monitoring Lab (1 CH)
Introduction to sampling techniques and analytical methods to measure environmental contamination in air, water, soils, and food. Emphasis on instrument selection and quality control, including documentation, calibration, and sample management. Wind flow rates. Quantification of noise. Quantification of light intensity. Humidity levels

ENV 335 Analytical Techniques in Environmental Sciences (2 CH)
Theory: Introduction, Principal of physical, chemical and microbiological analysis of environmental pollutants, Sampling rules, procedure, collection and their preservations for the examination of water, waste water, air, solid waste and soil, Lab technique and field monitoring, Conventional chemical analysis, Analytical Environmental data, assessment and interpretation, Separation Techniques, Electro analytical techniques, Thermal method of analysis, Biological indicators, General principle of spectrometry, Instrumental techniques

using atomic absorption, U.V-visible, infrared spectrophotometers, gas chromatography, X-ray defraction, X-ray Florence etc.

ENL 335 Analytical Techniques in Environmental Sciences Lab (1 CH)
Analytical basics (separation versus detection, precision, "accuracy", common sense, trace analysis (metal and organic), contamination, blanks, protocols, note keeping, sampling), spectrometric theory (atomic absorption, UV, IR, fluorescence, colorimetry: Atomic Absorption for metals, UV for silica and nitrate, IR detection, pH detection), electrodes (function, G, examples of uses in marine chemistry: pH electrodes, microelectrodes; oxygen electrodes), chromatographic theory – LC and GC.

ENV 340 Solid Waste Management (2 CH)
Sources and impacts of waste, Sustainability and the economics of waste management, Integrated Waste Management and Life Cycle Analysis, Quantification of waste, Waste minimisation and reuse, Collection, and sorting systems, Biological treatments, Incineration, Landfill, Recycling and Integrated Waste Management Case Studies, Wastewater emissions and water quality, Waste gas emissions and climate change.

ENL 340 Solid Waste Management Lab (1 CH)
Introduction, Responsibilities, Waste Minimization, General requirements, Specific Waste Management Requirements, Biological Waste Management, Chemical Waste Management, Radioactive Waste Management, Mixed Waste (mixtures of biological, chemical and/or radioactive), Sharp Waste Management, Laboratory Decommissioning, composting, recycling

GEO 437 GIS & Remote Sensing (2 CH)
Introduction to Geographical Information System, Data Types (Spatial/Aspatial), Data Models and Structures (Rater/Vector), Data Sources and Capturing Techniques, Displaying and Manipulating spatial information, Vector Data Preparation (Digitization and Spatial Data Editing), GPS Survey, Introduction to the concept of RS, Electromagnetic Spectrum, Atmospheric Interaction, Technology of Remote sensing (Orbits, Satellites, Sensors and Platforms), Applications of Remote Sensing, Satellite Image Processing Cycle, Image Enhancement, Data Fusion and Masaicing Information Extraction (Classification and Vectorizaion).

GEL 437 GIS & Remote Sensing Lab (1 CH)
Lab: Introduction to ArcCatalog, Introduction to ArcMap, Project a file from GCS to PCS (coordinate systems), How to Import Coordinate systems, Creation of File geodatabase and shapefile (vectors), Convert a shapefile to Personal Geodatabase (vectors), Finding and Downloading Geospatial Data (shapefiles), Edit A Shapefile, View Satellite Image in ArcMap (rasters), View USGS DEM data, Convert Raster to Vector, Georeferencing and rectify a scanned image, Georeferencing and rectify a scanned image, Perform Image to Map transformation, Make Study area Map, Element of study are map, Use symbology.

ENV 420 Research Methods in Environmental Sciences (3 CH)

The course is designed to introduction to Research and Research Methods, Meaning of Research, Objectives of Research, Research Steps, Research Characteristics. How Research is Done Research their Process and Criteria for good Research. Types of Research, Research Approaches, Significance of Research, Qualities of a Researcher. Research proposals and writing methods: Introduction, implications of a sample design, steps in sampling design, characteristics of a good sample design Different types of sample design: probability sampling, non – probability sampling, and further types in details. Methods of Data Collection: Collection of Primary Data and secondary data and their various methodology Collection of data through questionnaire and interview and their demerits Research proposal/ thesis format and References discussions

ENV 440 Energy and Environment (2 CH)

This course explores the scientific foundations of current energy and environmental issues and their implications for public policy. The syllabus is divided into sections, each examining a current environmental theme in depth. The first sections investigate the composition of the atmosphere and the chemical processes that cause air pollution, ozone depletion, and global warming. Moving to the study of water, the course explores the properties of this unique solvent and the effect of various aqueous pollutants. The course also includes an investigation of energy from chemical reactions, our continuing reliance on fossil fuels, and the potential of alternative energy sources. The laboratory experiments are closely integrated with the lecture topics and provide hands-on explorations of central course themes. Throughout the course we also will examine how scientific studies of the environment are intimately connected with political, economic and policy concerns.

ENL 440 Energy and Environment Lab (1 CH)

Production of biodiesel as biofuel from various renewable sources, determination of calorific values of alternate solid energy sources such as domestic and commercial waste, one day field visit to alternate energy production units (industrial/non industrial).

Bachelor of Science (BS) GEOLOGY
Proposed Roadmap as Per HEC 2023 Undergraduate Policy

Program Educational Objectives (PEOS)

Following are the sample program educational objectives that are expected to be exhibited by the Geology graduates.

1. **PEO-1:** Demonstrate sound scientific knowledge and skills.

2. **PEO-2:** Work, manage and illustrate effective teamwork, interpersonal skills and professional growth.
3. **PEO-3:** Undertake professional practice considering ethical, societal and geological implications.

Program Learning Outcomes (PLOS)

1. **Academic Education**: Prepare graduates as geological professionals.
2. **Scientific Knowledge**: Ability to acquire a solid base of knowledge and skills in the science of geology.
3. **Problem Analysis:** Analyze/investigate geological materials, features, and processes both qualitatively and quantitatively.
4. **Design and Development**: Apply critical thinking skills to develop solutions for geological problems using the scientific tools/techniques/methods.
5. **Investigation:** Investigate the complex geological problems/phenomenon in a systematic way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions
6. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources, and modern geological and IT tools for solutions of geological problems
7. **Individual and Teamwork:** Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings
8. **Ethics:** Understand and commit to professional ethics, responsibilities, and norms of scientific practices.
9. **Life-long Learning:** Develop the aptitudes and dispositions necessary to help democratize society by obtaining and maintaining employment as a professional geologist.

Mapping of PLOs to PEOs

No.	Programme Learning Outcomes (PLOs)	PEOs		
		PEO-1	PEO-2	PEO-3
PLO-1	**Academic Education**	✔	✔	
PLO-2	**Scientific Knowledge**	✔		
PLO-3	**Problem Analysis**	✔		
PLO-4	**Design and Development**	✔		✔
PLO-5	**Investigation**	✔		
PLO-6	**Modern Tool Usage**	✔	✔	
PLO-7	**Individual and Teamwork**		✔	✔
PLO-8	**Ethics**		✔	✔
PLO-9	**Life-long Learning**			✔

BS Geology PROPOSED ROADMAP

HEC UG Policy				Existing Geology Road Map		Proposed Geology Road Map	
		CH	**No. Courses**	Credit Hours	Courses	Credit Hours	Courses
General Education	Natural Sciences	3	1	6	2	6	2
	Social Sciences	2	1	3	1	2	1
	Arts and Humanities	2	1	0	0	2	1
	Expository Writing	3	1	6	2	3	1
	Functional English	3	1	3	1	3	1
	Quantitative Reasoning	6	2	6	2	6	2
	Ideology and Const. of Pak	2	1	2	1	2	1
	Islamiat	2	1	2	1	2	1
	Application of ICT	2+1	1	0	0	2+1	1
	Entrepreneurship	2	1	0	0	2	1
	Civics and Comm. Engage	2	1	0	0	2	1
	Total	30	12	28	10	33	12
Major	Diff. Courses	72	As per req.	95	33	81	27
Int. Disciplinary	Diff. Courses	12	4	12	4	12	4
Capstone Project	Thesis	3	NA	6	1	3	1
Field Experience/ Internship	Field Visit	3	NA	6	2	3	1
	Total	120		135		132	

SUMMARY

HEC GUIDELINES	**HEC UG POLICY 2023**	**PROPOSED ROADMAP**
General Education Courses: 13	30 Credit Hours	**33 Credit hours**
Major (Disciplinary) Requirements	Minimum 72 Credit Hours	**81 Credit Hours**
Interdisciplinary/allied courses: 04	12 Credit Hours	**12 Credit Hours**
Field Work Course: 01	3 Credit Hours	**03 Credit Hours**
Capstone Project: 01	3 Credit Hours	**03 Credit Hours**
Total	120-144 Credit Hours	**132 Credit Hours**

Semester 1										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Existing Course Title**	**Credit Hour**		**Course Code**	**Proposed**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	ENG 103	English-I	3	0	ENG 105	Functional English	3	0	General Education Course (Functional English)	Change of Course Title
2	PHY 101	Physics	2	1	PHY 101	Physics	2	1	General Education Course (Natural Sciences)	1 CH for lab Added, Course Contents Modified
					PHL 101	Physics Lab				
3	CSC 105	Introduction to Computers	3	0	CSC 102	Introduction to Computers & Programming	2	1	General Education Course (Quantitative Reasoning)	Changed from Introduction to Computers (CSC 105), Course Contents Modified
					CSL 102	Introduction to computers & Programming lab				
4	PAK 101	Pakistan Studies	2	0	……..	Ideology & Constitution of Pakistan	2	0	General Education Course (Ideology & Constitution of Pakistan)	New Course added
5	GEO 105	Physical & General Geology	3	0	GEO 105	Physical & General Geology	3	0	Major (Disciplinary) Requirements	Existing
6	ISL 101	Islamic Studies	2	0	ISL 101	Islamic Studies	2	0	General Education Course (Islamic/Religious Studies)	No Change

7	MAT 105	Mathematics	0	0	MAT 105	Mathematics	0	0	Zero Credit Course (1 zero credit course for Math	No Change
8					ISL 107	Tajweed	Non- Credited 1 hour per week	0		
						Total Credit Hours	**16**			

Semester 2										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Proposed**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	ENG 104	English -II	3	0	HSS 320	Technical Writing and Presentation Skills	3	0	General Education Course (Expository Writing)	Change of Course Title
2	CHM 105	Chemistry	3	0	CHM 105 CHL 105	Chemistry Chemistry Lab	2	1	General Education Course (Natural Sciences)	1 CH for lab Added, Course Contents Modified
3	GEO 115	Introduction to Geophysics	3	0	GEO 115	Introduction to Geophysics	3	0	Major (Disciplinary) Requirements	Existing
4	GEO 120 Pre-req GEO 105	Field Geology	3	0	GEO 120 GEL 120	Field Geology Field Geology Lab	2	1	Major (Disciplinary) Requirements	1 CH for lab Added, Course Contents Modified
5	GEO 110	Fundamental of Geography & Geomorphology	3	0	GEO 110	Fundamental of Geography & Geomorphology	3	0	Major (Disciplinary) Requirements	Existing
6	MAT 115	Calculus & Analytical Geometry	3	0	MAT 115	Calculus & Analytical Geometry	3	0	Quantitative Reasoning (2)	Existing
7					ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0		
						Total Credit Hours	**18**			

Semester 3										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	ENG 232	Oral Communication	3	0	GEO 201	Muesology	2	0	General Education Course (Arts and Humanities)	New Course added / Replaced Oral Communication
2	CSC 202	Programming Fundamentals	3	0		Civics and Community Engagement	2	0	Civics	New course added as per HEC Policy / Replaced Programming Fundamentals
3	GEO 205	Structural Geology	3	0	GEO 205	Structural Geology	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab added, Course Contents Modified
					GEL 205	Structural Geology Lab				
4	GEO 210	Mineralogy & Crystallography	3	0	GEO 210	Mineralogy & Crystallography	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab added, Course Contents Modified
					GEL 210	Mineralogy & Crystallography Lab				
5	HSS 202	Introduction to Sociology	3	0	PSY 102	Introduction to psychology	2	0	Social Sciences	Existing
6	MAT 205	Statistics	3	0	GEO 212	Geostatistics	3	0	Interdisciplinary/allied courses	New course added
7					ISL 109	Understanding Quran-ii	Non credited 1 hour per	0		

							week			
						Total Credit Hours	**15**			

Semester 4

Existing Courses					New Roadmap as per HEC 2023 Policy					
Sr #	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1					……..	Entrepreneurship	2	0	General Education Course (Entrepreneurship)	New course added
2	GEO 225	Geochemistry	3	0	GEO 225	Geochemistry	3	0	Major (Disciplinary) Requirement	Existing
3	GEO 215	Sedimentology	3	0	GEO 215	Sedimentology	3	0	Major (Disciplinary) Requirement	Existing
4	GEO 230	Geotectonics	3	0	GEO 230	Geotectonics	3	0	Major (Disciplinary) Requirements	Existing
5	MAT 210	Advance Mathematics	3	0	……	Applications of ICT Applications of ICT	2	1	General Education Course (Applications of Information and Communication Technologies (ICT))	New course added as per HEC Policy
6	GEO 221	Optical Mineralogy	3	0	GEO 221	Optical Mineralogy	3	0	Major (Disciplinary) Requirements	Existing
					ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0		
						Total Credit Hours	**17**			

Semester 5

Existing Courses					New Roadmap as per HEC 2023 Policy					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 325	Stratigraphy of Pakistan	3	0	GEO 325	Stratigraphy of Pakistan	3	0	Major (Disciplinary) Requirements	Existing
2	GEO 320	Marine Geology	3	0	GEO 345	Petroleum Geology	3	0	Major (Disciplinary) Requirements	Existing / Shifted from 6th Semester to 5th Semester Replaced Marine Geology which is shifted to 6th semester
3	GEO 305	Environmental Geology	3	0	GEO 305	Environmental Geology	3	0	Major (Disciplinary) Requirements	Existing
4	GEO 310	Paleontology	3	0	GEO 310	Paleontology	3	0	Major (Disciplinary) Requirements	Existing
5	GEO 315	Igneous & Metamorphic Petrology	3	0	GEO 315	Igneous & Metamorphic Petrology	3	0	Major (Disciplinary) Requirements	Existing
6					ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0		
7	GEO 326	Computing with Matlab	3	0	GEO 326	Computing with Matlab	2	1	Interdisciplinary/allied courses	Existing
					GEL 326	Computing with Matlab Lab				
						Total Credit Hours	**18**			

Semester 6										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 304	Wire line logging	3	0	GEO 340 GEL 340	Wire line logging Wire line logging Lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab added, Course Contents Modified
2	GEO 330	Micropaleontology & Biostratigraphy	3	0	GEO 330 GEL 330	Micropaleontology & Biostratigraphy Micropaleontology & Biostratigraphy Lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab added, Course Contents Modified
3	GEO 235	Geological Field Work and Report - I	0	3	GEO 360	Geological Field Work and Report	0	3	Major (Disciplinary) Requirements	Course name Changed
4	GEO 350	Geology of Pakistan	3	0	GEO 350	Geology of Pakistan	3	0	Major (Disciplinary) Requirements	Existing
5	GEO 345	Petroleum Geology	3	0	GEO 320	Marine Geology	3	0	Major (Disciplinary) Requirements	Shifted from 5th semester, Replaced Petroleum Geology which is shifted to 5th semester
6	GEO 335	Earthquake Seismology	3	0	GEO 335	Neotectonics	3	0	Major (Disciplinary) Requirements	Replaced Earthquake Seismology, New course added
					ISL 112	Understanding Quran-v	Non credited 1 hour every week	0		
						Total Credit Hours	**18**			

Semester 7										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 425	Research Methodology	2	0	GEO 425	Research Methodology	3	0	Interdisciplinary/allied courses	Existing / 1 CH Added, Course Contents Modified
2	GEO 410	Engineering Geology	3	0	GEO 410 GEL 410	Engineering Geology Engineering Geology Lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab Added, Course Contents Modified
3	GEO 355	Field Work & Report II	3	0	GEO 437 GEL 437	GIS & Remote Sensing GIS & Remote Sensing Lab	2	1	Interdisciplinary/allied courses	Shifted from 8th Semster, 1 CH of Lab Added, Course Contents Modified. Field work and Report-II removed as per HEC Policy
4	GEO 420	Hydrogeology	3	0	GEO 420	Hydrogeology	3	0	Major (Disciplinary) Requirements	Existing
5	GEO 415	Economic Geology	3	0	GEO 415	Economic Geology	3	0	Major	Existing
6					ISL 113	Seerah-i	Non credited 1 hour every week	0		
						Total Credit Hours	**15**			

Semester 8										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 445	Seismic Stratigraphy	3	0	GEO 469	Industrial Mineralogy	3	0	Major	New Course added replacing Seismic Stratigraphy
2	GEO 437	GIS & Remote Sensing	3	0	GEO 475	Mining Geology	3	0		New Course added, Replaced GIS and Remote Sensing which is shifted to 7th Semester
3	GEO 430	Geochemical Exploration Techniques	3	0	GEO 430	Geochemical Exploration Techniques	3	0	Major	Existing
4					GEO 484	Quaternary Geology	3	0	Major	New Course added
5	GEO 440	Thesis	0	6	GEO 440	Thesis / Capstone Project	0	3	Capstone Project	Existing / 3 CH reduced
6					ISL 114	Seerah-ii	Non credited 1 hour every week	0		
						Total Credit Hours	**15**			

Course Description

Course Description of General Education and Foundation Courses for BS Geology Program

Course Name: Field Geology
Credit Hours: 2
Contact Hours: 2+0
Pre-Requisites: GEO 105
Course Code:GEO 120
Contents:
Instruments used in field mapping. Introduction to topographic and Geological maps. Methods and techniques of surface and subsurface Geological mapping. Correlation techniques. Field description of igneous, metamorphic and sedimentary rocks. Modes of Geological illustration including structural contour, isopach and litho-facies maps, block and fence diagrams. Field mapping, preparation of Geological maps and cross-section. Fieldwork: Each student is required to do Fieldwork and submit a report in the examination. The Fieldwork should cover; observation of physical features and their plotting on topographic sheet. Study of geomorphic feature. Measurement of stratigraphic sections. Recognition of structural features. Fauna observation. Study of primary and secondary structures. Field description of sedimentary, igneous and metamorphic rocks.
Reference Books
Introduction to Field Geology, Bevier, M.L., 2006. McGraw-Hill Ryerson
Lecture Series by University of Nairobi; SGL:308.

Course Name: Field Geology Lab
Credit Hours: 1
Contact Hours: 2+0
Pre-Requisites: GEO 105
Course Code:GEL 120
Contents:
Parts of Brunton Compass; Block Diagrams of Anticline and Syncline; activity of measuring true thickness and outcrop thickness and their relationship with strata inclination and land surface; Position finding on base map using GPS values. Activity of taking bearing from waist level, eye level and use of compass as hand level; Contour activity, Area calculation, Assigning elevations; Activity of contour drawing through triangulation method; Finding outcrop patterns Profile drawing using base map; Preparation of Litholog; Preparation of pi and beta diagram for fold classification using wulff stereonet; Preparation of Rose diagram
Reference Books
Basic Geological Mapping by John W. Barnes and Richard J. Lisle; John Wiley & Sons, Ltd
Introduction to Geological Mapping

Course Name: Structural Geology
Credit Hours: 2
Contact Hours: 2+0
Pre-Requisites: None

Course Code:GEO 205

Contents:

Dynamics of rock deformation and mechanical properties of rocks; Stress and strain concepts; Factors controlling mechanical behavior of Materials; Folds classification based on morphology, geometry, and vergence; Mechanics of fold formation; Faults classification based on geometry and genesis; Structures in compressional and extensional regimes; Classification of Joints, foliations and lineation; Unconformities, their classification and recognition. Laboratory exercises on geologic map interpretation and cross sections; Field trips to area where good Geological structures are exposed.

Reference Books

Physical geology by plummer, Turbak and Marshik
Field geology by Kompton
Structural geology of rocks and regions by Davies

Course Name: Structural Geology Lab

Credit Hours: 1

Contact Hours: 2+0

Pre-Requisites: None

Course Code:GEL 205

Contents:

Map exercises, linear and planar structures, and construction of geological cross-sections; orthographic projections (geometrical exercises); stereographic projections, fault plane solutions, stress and strain analysis using oriented samples and use of structural computer software.

Reference Books

Geological structures and maps by Richard j lisle

Course Name: Mineralogy and Crystallography

Credit Hours: 2

Contact Hours: 2+0

Pre-Requisites: None

Course Code:GEO 210

Contents:

Introduction to Crystallography; elements of symmetry, symmetry operations, crystal notation, crystal systems study of normal classes of crystallographic systems; Classification and system study of minerals with an emphasis on their crystallographic features, physical properties, Chemical composition, occurrences, associations and uses; Introduction to X-ray crystallography

Reference Books

Dana's textbook of mineralogy

Course Name: Mineralogy and Crystallography Lab

Credit Hours: 1

Contact Hours: 2+0

Pre-Requisites: None

Course Code:GEL 210

Contents:

Study of crystal morphology, preparation of crystal models, orientation of crystallographic axes in different systems, identifying elements of symmetry, symmetry of different crystal systems, crystal forms. Construction and interpretation of unary phase diagrams. Construction and interpretation of binary phase diagrams. Identification and description of different physical properties of the minerals, metallic and non-metallic mineral resources. Hand specimen identification of minerals.

Reference Books

Mineralogy Dexter Perkins, Earth Lab

Course Name: Geostatistics
Credit Hours: 3
Contact Hours: 3+0
Pre-Requisites: None
Course Code:GEO 216
Contents:

Descriptive statistics and exploratory data analysis, random variable; moments; probability distributions; normal and lognormal distributions, random function model, modeling spatial continuity; experimental variograms covariance functions; correlograms and madograms; variogram and covariance function models; isotropy and anisotropy, estimation methods: simple kriging.

Reference Books

Kitanidis, P.K. (1997) Introduction to geostatistics: applications in hydrology.
Goovaerts,Pierre (1999) Geostatistics for Natural Resource Evaluation.
Olea, R. A. (1999) Geostatistics for Engineers and Earth Scientists.
Christakos, G (2000) Modern Spatiotemporal Geostatistics.
Webster, R. and Webster, M (2001) Geostatistics for Environmental Scientists.

Course Name: Wireline Logging
Credit Hours: 2
Contact Hours: 2+0
Pre-Requisites: None
Course Code:GEO 340
Contents:

Introduction; Types of Logs; Methods and principles; Factors influencing Logs; Resistivity logs; SP logs; Gamma Ray logs; Formation density logs; Neutron logs; Sonic logs; Caliper logs. Application of logs; Porosity determination; Lithology and Hydrocarbon Detection; Structural interpretation; Correlation.

Reference Books

AAPG Basic Well Log Analysis by George Asquith and Daniel Krygowski
Schlumberger – Log interpretation Principles/Applications

Course Name: Wireline Logging Lab
Credit Hours: 1
Contact Hours: 2+0
Pre-Requisites: None
Course Code:GEL 340

Contents:

How to read well logs and its presentation, Pattern recognition and correlation of well logs, Estimation of Shale content; Gross Pay vs. Net Pay, Estimation of porosity from a single log, Multiple porosity methods, Water Saturation determination, Gas Sand Interpretation, Identification of lithologies and crossplots, Stock Tank Original Oil In Place (STOOIP) calculation, Image log interpretation

Reference Books

Schlumberger – Log interpretation Principles/Applications

GEO 330 Micropaleontology and Biostratigraphy (2 CH)

Introduction to Foraminifera, Bryozoa, Ostracoda, Conodonts, Algae, Pollen and Spores; Organic walled microplanktons and nano-fossils; Principles of bio-stratigraphy and bio-stratigraphic zones; Biostratigraphic techniques and procedures; Tertiary bio-stratigraphy with special reference to Pakistan. Lab: Basic micro-paleontological and bio-stratigraphic techniques. Morphological and taxonomic studies of selected microfossils.

GEL 330 Micropaleontology and Biostratigraphy Lab (1 CH)

Lab: Sampling techniques, labelling and storing, cataloging and shelving, casting and molding, faunal preservation techniques, thin section preparation, microfossils extraction, organization of foraminifera, treatments of planktons, study of micropaleontological samples, as an individual research practice during the second half of each practical session, field excursion to Permian/Tertiary rocks of Salt Range/Kohat Sub-basin

GEO 335 Neotectonics (3 CH)

Active tectonics and neotectonics: definitions, active faults and criteria for identifying active faulting; direct measurements of tectonic movements; direct measurement with geodetic networks; triangulation of sites with reference to satellites; global positioning systems; geology and earthquakes; earthquake seismology; paleoseismology; trenching and seismic trenching; Quaternary dating methods; tectonic geomorphology; offset geological-geomorphological features (paleoseismic indicators, changes in elevations of coast lines, stream offsets, slope retreat, terraces, incised meander); fault scarp morphology; neotectonics behavior of faults and folds; hazards of active tectonics: earthquakes and mass movements; remote sensing and satellite imageries applications in neotectonics and related hazards; active tectonics and nuclear waste disposal; neotectonics of Pakistan and Himalayas.

Course Name: Research Methodology
Credit Hours: 3
Contact Hours: 3+0
Pre-Requisites: None
Course Code:GEO 425
Contents:

An Overview of Research Methods and Methodologies; Difference Between “Method” and “Methodology”; Epistemology, Methodology, and Method; An Overview of Empirical Research Methods: Descriptive (Qualitative) & Experimental (Quantitative); Assessing Methods; Ethnographies; Case Studies; Survey Research; Focus Groups; Discourse/Text Analysis; Quantitative Descriptive Studies; Prediction and Classification Studies; Meta-Analysis; Validity in Research; Reliability in Research; Rigor in Research; Key Considerations to Design Your Research Approach; The Importance of Methods and Methodology.

Reference Books

Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, by John W. Creswell

GEO 410 Engineering Geology (2 CH)

Basic concept of Engineering Geology; Mass-wasting, landslide and other rock movements; Uplift and settlement problems; Excavation and tunneling; Introduction to soil mechanics; Classification and characteristics of soil; Engineering properties of soil; Introduction to rock mechanics, stress and strain characteristics in deformation of rocks; rock classification; rock engineering properties; Geology of the engineering structures: dams, tunnels, bridges.

GEL 410 Engineering Geology Lab (1 CH)

Sieve analysis, slake durability, moisture content, determination of elastic limit, determination of plasticity limit, coring techniques, void ratios, porosity, angle of repose, and other geotechnical properties of soils. Uniaxial and Triaxial Testing; tensile, compressive and shear tests of rocks.

GEO 469 Industrial Mineralogy (3 CH)

Physical and chemical properties of minerals; relationship between the structure, chemistry and properties of various rocks and minerals. Mechanisms of mineral nucleation and crystal growth; importance of kinetics in mineral formation. Exploration and Exploitation techniques; sands and gravels, hard rock aggregates, dimension stone, slate, limestone and dolomite, magnesite, clays (common clay/shale, kaolin, bentonite, and fuller's earth), silica sand, dunite and serpentinite, feldspars, nepheline syenite; natural abrasive raw materials, gypsum, anhydrite, chromite, barite and gemstones including diamond and their industrial uses. Mineralogy and chemistry of raw materials for cement, glass, agriculture, chemical and refractories; industrial minerals and their environmental impacts; risk assessment and economic evaluation. Economic potential of industrial rocks and minerals in Pakistan.

GEO 475 Mining Geology (3 CH)

Introduction to Mining Geology, Terminology related to mining; mining survey techniques; surface and subsurface mining methods; opening of mines; structural controls in mining; correlation of surface and subsurface data; spatial relationship of seams; surface and underground mapping methods; calculation of ore grade and tonnage; gases in mines and spontaneous combustion; rock pressure and support; collapses in mines and their safety/remedial measures; mine-refuse disposal management; ore grade control in mining; impact of mining on environment and their remedies and rehabilitation; introduction to mining explosives; coring, core logging and data interpretation; the effects of gasses and radioactive isotopes on miners health. Miner's diseases, their monitoring and remedial measures.

GEO 484 Quaternary Geology (3 CH)

The Quaternary period: Character, duration, development and climatic changes; soil characteristics; soil stratigraphy; morphological evidence and landforms; Quaternary environments; Pleistocene glaciation and sea level changes; lithological evidence of environments; types of sediments; isotopes in deep-sea sediments; biological evidence; plant fossils and animal remains; dating methods; Quaternary stratigraphy and correlation;

Quaternary geology, geochronolgy and neotectonics; Quaternary deposits of Pakistan and its importance (alluvial, fluvial, colluvial, lacustrine, glacial and eoline deposits).

Bachelor of Science (BS) Geophysics
Proposed Roadmap as Per HEC 2023 Undergraduate Policy

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

The educational objectives of Geophysics undergraduate program are for the graduates to attain the following within a few years of graduation:

1. Secure employment in governmental or private sector, or engage in entrepreneurship. (PEO 1)
2. Pursue careers by demonstrating leadership and interpersonal skills by teamwork and communication skills. (PEO 2)
3. Advance their professional development through self-learning or pursue advanced degrees. (PEO 3)

PROGRAM LEARNING OUTCOMES (PLO's)

PLO1 Academic Education: A fundamental understanding of the academic field of Geophysics, its different learning areas and application
PLO2 Knowledge: Apply knowledge of geosciences, for the solution of defined problems
PLO3 Problem Analysis: Demonstrate the ability to use skills in Geophysics and its related areas of technology for formulating and tackling geosciences related problems.
PLO4 Design/ Development of Solutions: Plan and execute Geophysics-related investigations, analyze and interpret data collected using appropriate methods to report accurately the findings of the investigations while relating the conclusions to relevant theories in Geophysics.
PLO5 Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex earth processes, with an understanding of the limitations.
PLO6 Individual and Teamwork: Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.
PLO7 Communication: Communicate effectively with the geoscience community and with society at large about activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
PLO8 Professionalism and Society: Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional practices
PLO9 Ethics: Understand and commit to professional ethics, responsibilities, and norms of professional geoscience practice.
PLO10 Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

Mapping of PLO'S and PEO'S

S. No	Programe Learning Outcomes (PLO's)	PEO's		
		PEO 1	PEO 2	PEO 3
1	Academic Education	✓	✓	

2	Knowledge	✓	✓	
3	Problem Analysis	✓		
4	Design/ Development of Solutions	✓	✓	
5	Modern Tool Usage	✓		✓
6	Individual and Teamwork		✓	✓
7	Communication			✓
8	Professionalism and Society		✓	✓
9	Ethics		✓	✓
10	Life-long Learning			✓

BS Geophysics PROPOSED ROADMAP

HEC UG Policy				Existing Geophysics Road Map		Proposed Geophysics Road Map	
		CH	**No. of Courses**	Credit Hours	Courses	Credit Hours	Courses
General Education	Natural Sciences	3	1	6	2	6	2
	Social Sciences	2	1	3	1	2	1
	Arts and Humanities	2	1	0	0	2	1
	Expository Writing	3	1	6	2	3	1
	Functional English	3	1	3	1	3	1
	Quantitative Reasoning	6	2	6	2	6	2
	Ideology and Const. of Pak	2	1	2	1	2	1
	Islamiat	2	1	2	1	2	1
	Application of ICT	2+1	1	0	0	2+1	1
	Entrepreneurship	2	1	0	0	2	1
	Civics and Comm. Engage	2	1	0	0	2	1
	Total	30	12	28	10	33	12
Major	Diff. Courses	72	As per req.	95	33	81	27
Int. Disciplinary	Diff. Courses	12	4	12	4	12	4
Capstone Project	Thesis	3	NA	6	1	3	1
Field Experience/Internship	Field Visit	3	NA	6	2	3	1
	Total	120		135		132	

SUMMARY

HEC GUIDELINES	**HEC UG POLICY 2023**	**PROPOSED ROADMAP**
General Education Courses: 13	30 Credit Hours	**33 Credit hours**
Major (Disciplinary) Requirements	Minimum 72 Credit Hours	**81 Credit Hours**
Interdisciplinary/allied courses: 04	12 Credit Hours	**12 Credit Hours**
Field Work Course: 01	3 Credit Hours	**03 Credit Hours**
Capstone Project: 01	3 Credit Hours	**03 Credit Hours**

Total	120-144 Credit Hours	**132 Credit Hours**

Semester 1

Existing Courses					New Roadmap as per HEC 2023 Policy					
Sr#	**Course Code**	**Existing Course Title**	**Credit Hour**		**Course Code**	**Proposed**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	ENG 103	English-I	3	0	ENG 105	Functional English	3	0	General Education Course (Functional English)	Change of Course Title
2	PHY 101	Physics	3	0	PHY 101	Physics	2	1	General Education Course (Natural Sciences)	1 CH for lab Added, Course Contents Modified
					PHL 101	Physics Lab				
3	CSC 105	Introduction to Computers	3	0	CSC 102	Introduction to Computers & Programming	2	1	General Education Course (Quantitative Reasoning)	Changed from Introduction to Computers (CSC 105), Course Contents Modified
					CSL 102	Introduction to computers & Programming lab				
4	PAK 101	Pakistan Studies	2	0	…….	Ideology & Constitution of Pakistan	2	0	General Education Course (Ideology & Constitution of Pakistan)	New Course added
5	GEO 105	Physical & General Geology	3	0	GEO 105	Physical & General Geology	3	0	Major (Disciplinary) Requirements	Existing
6	ISL 101	Islamic Studies	2	0	ISL 101	Islamic Studies	2	0	General Education Course (Islamic/Religious Studies)	No Change
7	*MAT 105	Mathematics	0	0	MAT 105	Mathematics	0	0	Zero Credit Course	No Change
8					ISL 107	Tajweed	Non- Credited 1 hour per week	0		
						Total Credit Hours	**16**			

- Zero Credit Hour subject compulsory for Pre-Medical Students

Semester 2										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Proposed**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	ENG 104	English -II	3	0	HSS 320	Technical Writing and Presentation Skills	3	0	General Education Course (Expository Writing)	Change of Course Title
2	CHM 105	Chemistry	3	0	CHM 105 CHL 105	Chemistry Chemistry Lab	2	1	General Education Course (Natural Sciences)	1 CH for lab Added, Course Contents Modified
3	GEO 115	Introduction to Geophysics	3	0	GEO 115	Introduction to Geophysics	3	0	Major (Disciplinary) Requirements	Existing
4	GEO 120 Pre-req GEO 105	Field Geology	3	0	GEO 120 GEL 120	Field Geology Field Geology Lab	2	1	Major (Disciplinary) Requirements	1 CH for lab Added, Course Contents Modified
5	GEO 110	Fundamental of Geography & Geomorphology	3	0	GEO 110	Fundamental of Geography & Geomorphology	3	0	Major (Disciplinary) Requirements	Existing
6	MAT 115	Calculus & Analytical Geometry	3	0	MAT 115	Calculus & Analytical Geometry	3	0	Quantitative Reasoning (2)	Existing
7					ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0		
						Total Credit Hours	**18**			

Semester 3										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	ENG-232	Oral Communication	3	0	GEO 201	Museology	2	0	General Education Course (Arts and Humanities)	New Course added, Replaced Oral communication
2	CSC-205	Programming Fundamentals	3	0		Civics and Community Engagement	2	0	Civics	New course added as per HEC Policy , Replaced Programming Fundamentals
3	GEO 205	Structural Geology	3	0	GEO 205 GEL 205	Structural Geology Structural Geology Lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab Added, Course Contents Modified
4	GEO 210	Mineralogy & Crystallography	3	0	GEO 210 GEL 210	Mineralogy & Crystallography Mineralogy & Crystallography Lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab Added, Course Contents Modified
5	HSS 202	Introduction to Sociology	3	0	PSY 102	Introduction to Psychology	2	0	General Education Course (Social Sciences)	New course added / Replaced Introduction to Sociology
6	MAT 205	Statistics	3	0	GEO 212	Geostatistics	3	0	Interdisciplinary/allied courses	New course added, Replaced Statistics

7					ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0		
						Total Credit Hours	**15**			

Semester 4

Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr #	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1						Entrepreneurship	2	0	General Education Course (Entrepreneurship)	New course added
2	MAT 210	Advance Mathematics	3	0		Applications of ICT Applications of ICT Lab	2	1	General Education Course (Applications of Information and Communication Technologies (ICT))	New course added as per HEC Policy
3	GEO 240	Gravity and Magnetic Exploration Techniques	3	0	GEO 240	Gravity and Magnetic Exploration Techniques	3	0	Major (Disciplinary) Requirement	Existing
4	GEO 215	Sedimentology	3	0	GEO 215	Sedimentology	3	0	Major (Disciplinary) Requirement	Existing
5	GEO 230	Geotectonics	3	0	GEO 230	Geotectonics	3	0	Major (Disciplinary) Requirements	Existing
6	GEO 365 Pre-Req GEO 115	Electrical & Radioactive Expl Tech	3	0	GEO 335	Earthquake Seismology	3	0	Major (Disciplinary) Requirements	Existing / Shifted from 6th semester to 4th semester/ Electrical & Radioactive Exploration Tech shifted to 5th Semester
7					ISL 110	Understanding Quran-iii	Non credited 1 hour	0		

							every week			
						Total Credit Hours	**17**			

Semester 5										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 315	Igneous & Metamorphic Petrology	3	0	GEO 332	Rock Physics	3	0	Major (Disciplinary) Requirements	New Course Added / Replaced Igneous & Metamorphic Petrology
2	GEO 320	Marine Geology	3	0	GEO 345	Petroleum Geology	3	0	Major (Disciplinary) Requirements	Shifted from 6th Semester to 5th Semester, Replaced Marine Geology
3	GEO 325	Stratigraphy of Pakistan	3	0	GEO 325	Stratigraphy of Pakistan	3	0	Major (Disciplinary) Requirements	Existing
4	GEO 305	Environmental Geology	3	0	GEO 327	Environmental Geophysics	3	0	Major (Disciplinary) Requirements	New Course Added / Replaced Environmental Geology
5					ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0		
6	GEO 370	Geomagnetism and Paleomagnetism	3	0	GEO 364 GEL 364	Electrical & Radioactive Expl Tech Electrical & Radioactive Expl Tech Lab	2	1	Major (Disciplinary) Requirements	Existing / Shifted from 4th Semester to 5th Semester and 1 CH of lab added, Course Contents Modified, Replaced Geomagnetism & Paleomagnetism
7	GEO 320	Marine Geology	3	0	GEO 326 GEL 326	Computing with Matlab Computing with Matlab Lab	2	1	Interdisciplinary/allied courses	Existing /Replaced Marine Geology

Total Credit Hours	**18**

Semester 6

Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 340	Wireline Logging	3	0	GEO 340 GEL 340	Wireline Logging Wireline Logging lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab Added Course Contents Modified
2	GEO 367	Seismic Data Acquisition & Planning	3	0	GEO 367	Seismic Data Acquisition & Planning	3	0	Major (Disciplinary) Requirements	Existing
3	GEO 345	Petroleum Geology	3	0	GEO 379 GEL 379	Introduction to Machine Learning Introduction to Machine Learning Lab	2	1	Major (Disciplinary) Requirements	New Course Added / Petroleum Geology Shifted to 5th Semester
4	GEO 235	Geological Field Work and Report - I	0	3	GEO 362	Geological & Geophysical Field Work and Report	0	3	Major (Disciplinary) Requirements	Course name Changed
5	GEO 350	Geology of Pakistan	3	0	GEO 350	Geology of Pakistan	3	0	Major (Disciplinary) Requirements	Existing
6	GEO 335	Earthquake Seismology	3	0	GEO 311	Reservoir Geophysics	3	0	Major (Disciplinary) Requirement	New course Added / Earthquake Seismology shifted to 4th Semester
7					ISL 112	Understanding Quran-v	Non credited 1 hour every week	0		
						Total Credit Hours	**18**			

Semester 7

Existing Courses					New Roadmap as per HEC 2023 Policy					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 425	Research Methodology	2	0	GEO 425	Research Methodology	3	0	Interdisciplinary/allied courses	Existing / 1 CH Added, Course Contents Modified
2	GEO 470	Seismic Data Processing	3	0	GEO 470	Seismic Data Processing	3	0	Major (Disciplinary) Requirements	Existing
3	GEO 420	Hydrogeology	3	0	GEO 421 GEL 421	Ground water Investigation Ground water Investigation Lab	2	1	Major (Disciplinary) Requirements	New Course Added / Replaced Hydrogeology
4	GEO 405	Petroleum Engineering	3	0	GEO 437 GEL 437	GIS & Remote Sensing GIS & Remote Sensing Lab	2	1	Interdisciplinary/allied courses	Existing / Shifted from 8th to 7th Semester / Replaced Petroleum Engineering
5	GEO 415	Economic Geology	3	0	GEO 445	Seismic Stratigraphy	3	0	Major (Disciplinary) Requirements	Existing / Shifted from 8th to 7th Semester / Replaced Economic Geology
6					ISL 113	Seerah-i	Non credited 1 hour every week	0		
						Total Credit Hours	**15**			

Semester 8										
Existing Courses					**New Roadmap as per HEC 2023 Policy**					
Sr#	**Course Code**	**Course Title**	**Credit Hour**		**Course Code**	**Course Title**	**Credit Hour**		**Category as per HEC UG 2023 Policy**	**Remarks**
			Theory	**Lab**			**Theory**	**Lab**		
1	GEO 475	Seismic Data Interpretation	3	0	GEO 476 GEL 475	Seismic Data Interpretation Seismic Data Interpretation Lab	2	1	Major (Disciplinary) Requirements	Existing / 1 CH of Lab Added, Course Contents Modified
2	GEO 435	GIS & Remote Sensing	3	0	GEO 479 GEL 479	Geospatial Techniques Geospatial Techniques Lab	2	1	Major (Disciplinary) Requirements	New Course Added / Replaced GIS & Remote Sensing / Shifted to 7th Semester
3	GEO 445	Seismic Stratigraphy	3	0	GEO 480 GEL 480	Geophysical Softwares Geophysical Softwares Lab	2	1	Major (Disciplinary) Requirements	New Course Added / Replaced Seismic Stratigraphy / Shifted to 7th Semester
4					GEO 481	Mining Geophysics	3	0	Major (Disciplinary) Requirements	New Course Added
5	GEO 440	Thesis	0	6	GEO 440	Thesis / Capstone Project	0	3	Capstone Project	Existing / 3 CH reduced as per HEC Policy
6					ISL 114	Seerah-ii	Non credited 1 hour every week	0		
						Total Credit Hours	**15**			

Course Description of General Education and Foundation Courses for BS Geophysics Program

GEO 327 Environmental Geophysics (3 CH)

This course aims to provide skills required in research and consulting environments in hydrology, hydrogeology, climatology and environment sciences. Lectures on the theory behind various environmental geophysical methods used in the analysis of air, water, soil, vegetation or the subsurface. Field measurements to enable everyone to get hands-on experience of geophysical techniques. Methods covered will include a selection of the following environmental geophysical techniques: weather station design and hydrology measurements using geophysical techniques; infra-red measurements of soil and atmospheric carbon dioxide concentrations; x-ray fluorescence analysis of soil mineral properties; optical geophysics, using fluorescence and absorbance, to measure river organic matter water quality; cavity-ringdown and off-axis mass spectrometry measurements for mapping methane and carbon dioxide processes in the landscape.

GEO 364 Electrical and Radioactive Techniques (2 CH)

Electrical methods Basic Theory; Electrical properties of rock and minerals; self-potential method Basic; self-potential methods field and interpretation; self-Induce polarization methods principles and theory; IP methods field survey and interpretation study of a Case history; resistivity methods basic theory; Electrical resistivity relation and measurements; Resistivity and properties of materials; Acquisition and Processing of Data interpretation; Radioactive methods Basic theory Radioactive minerals and survey interpretation.

GEL 364 Electrical and Radioactive Techniques (1 CH)

Practical dat acquisition on field and practical exercises of interpretation of Electrical and Radioactive methods

GEO 332 Rock Physics (3CH)

The purpose of the course is to give an overview of rock physics observations and models relating reservoir properties such as saturation, lithology, clay content, and pore pressure and their seismic signatures. Understanding this relation can help to improve quantitative seismic interpretation. The course covers fundamentals of Rock Physics ranging from basic laboratory and theoretical results to practical “recipes” that can be immediately applied in the field. Application of quantitative tools for understanding and predicting the effects of lithology, pore fluid types and saturation, saturation scales, stress, pore pressure and temperature, and fractures on seismic velocity. Use of rock physics models requires understanding the assumptions and pitfalls of each model and the uncertainties associated with the interpretations using these models. Analysis of case studies and strategies for quantitative seismic interpretation using statistical rock physics work flows, and suggestions for more effectively employing seismic-to-rock properties transforms in Bayesian machine learning for reservoir characterization and monitoring, with emphasis on seismic interpretation and uncertainty quantification for lithology and subsurface fluid detection

GEO 379 Introduction to Machine Learning (2 CH)

This course provides a thorough introduction to the theoretical foundations and practical applications of ML. We will learn fundamental algorithms in supervised learning and unsupervised learning. We will not only learn how to use ML methods and algorithms but will

explain the underlying theory building on mathematical foundations. While reviewing the several problems and algorithms to carry out classification, regression, clustering, dimensionality reduction, core fundamentals will be focused which unify all the algorithms

GEL 379 Introduction to Machine Learning Lab (1 CH)

Students will gain an introductory-level understanding of both supervised and unsupervised machine learning (ML), including deeper knowledge of a number of algorithms of each type. Students will learn how to evaluate and quantify predictive performance of ML systems. Students will also become familiar with one or more ML development environments with practical assignments and demonstrations.

GEO 421 Ground Water Investigation (2 CH)

This course cover the details and criteria employed in groundwater investigations. Basic concepts and methods used to determine subsurface conditions pertaining to groundwater levels, pore water pressures and the permeability of subsurface materials are considered. Installation methods for observation wells and devices commonly used for sensing and measuring water levels in boreholes and observation wells are covered. Permeability is measured in the field by a variety of tests, which include seepage, pressure or packer, pumping, slug and the piezocone dissipation tests. Quality assurance for testing, obtaining measurements and logging subsurface data are considered. The AASHTO and ASTM designations for the commonly used tests are provided.

GEL 421 Ground Water Investigation Lab (1 CH)

Discussion of aquifer properties. These might include: a review of key diagrams to explain porosity, grain size and sorting, and tortuosity; and some examples of rock specimens that serve as aquifers or aquitards—for example, hand specimens of sandstones, shales, and other rocks that the students can inspect with hand lenses or pour water onto. Students will generate plots and interpret them. Interpretation of potentiometric surface maps, further developing the analogy to topographic maps, tracing flow lines, and the effects of pumping wells would help to solidify key concepts. Drawing upon current events for discussion of the link between well hydrographs and climatic conditions would also be valuable in both illustrating the connection between surface processes and groundwater resources, and in making the relevance of the material clearer. Physical groundwater simulators (so called "ant farms"), and demonstrations to help students visualize groundwater flow and the concept of hydraulic head.

GEO 476 Seismic Data Interpretation (2 CH)

Seismic data analysis techniques, Geological constraints regarding seismic data interpretation, Importance of seismic data quality, QC of data, Geological implementation in the seismic data, Seismic to well tie, Tying methods, Seismic correlation techniques, e.g Jump tie, loop tie, Interpretation ways, Mapping, 3 D surfaces, Practical implementation of different Software like Surfer, Open Tect, Kingdom, Geographix.

GEL 476 Seismic Data Interpretation Lab (1 CH)

Practical implementation of different Software like Surfer, Open Tect, Kingdom, Geographix.

GEO 479 Geospatial Techniques (2 CH)

Study of geospatial technology, including Geographic Information Systems (GIS), Global Positioning Systems (GPS), cartography, remote sensing, and spatial analysis. Application of Geographic Information Systems (GIS) science to spatial data management. Assessment of

vector and raster systems, scale, resolution, map projection, coordinate systems and georeferencing. Identification and acquisition of spatial data.

GEL 479 Geospatial Techniques Lab(1 CH)

This course introduces students to computer-based GIS, Geographic Information Systems, and its applications to spatial data management as a tool to understand the world by describing and explaining the human relationship to the physical environment. Topics include assessment of vector and raster systems, scale, resolution, map projection, coordinate systems, georeferencing and Global Positioning Systems (GPS). Hands-on exposure to spatial analysis and modeling with GIS through the use of computers

GEO 480 Geophysical Softwares (2 CH)
Introduction to software used in different industry. How to create and manage a project including establishing project boundaries, choosing an X/Y projection. the use of authors, CRS and its types. Culture (geographic layer) input: creating and entering culture data on the base map including formatted and unformatted data entry and the importing of ESRI shape files. Well data input: using file sources such as HIS Energy and ascii formatted data; loading of well locations, deviation surveys, formation tops, log curves, and local and shared Time-Depth information. Using the SEG-Y Viewer to examine 2D and 3D trace header data.

GEL 480 Geophysical Softwares Lab (1 CH)
How to create and manage a project including establishing project boundaries, choosing an X/Y projection. the use of authors, CRS and its types. Culture (geographic layer) input: creating and entering culture data on the base map including formatted and unformatted data entry and the importing of ESRI shape files. Well data input: using file sources such as HIS Energy and ascii formatted data; loading of well locations, deviation surveys, formation tops, log curves, and local and shared Time-Depth information. Using the SEG-Y Viewer to examine 2D and 3Dtrace header data.

GEO 481 Mining Geophysics
Role of Geophysical prospecting in Mining techniques like; Electromagnetic, Resistivity, Induced Polarization, Self-Potential, Radiometric, Gravity and Magnetic methods applied for metallic mineral deposits; Airborne, electromagnetic surveys; site design; theoretical basis for each technique, the instrumentation used; Working Conditions, data collection, processing and interpretation procedures; Deposition of coal; Seismic methods for identifying coal, iron and copper sulphides; Review of geophysical research conducted in Pakistan; Specified assignments/projects

Bachelor of Science (BS) Remote Sensing and GIS
Proposed Roadmap as Per HEC 2023 Undergraduate Policy

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

Following are the sample program educational objectives that are expected to be exhibited by the Geology graduates.

1. Demonstrate sound knowledge and skills (PEO 1)

2. Work, manage and illustrate effective teamwork, interpersonal skills and professional growth (PEO 2)

3. Undertake professional practice considering ethical, societal and environmental implications. Note: Institutions are expected to customize their own PEOs for their program requirements (PEO 3)

PROGRAM LEARNING OUTCOMES (PLO's)

PLO1 Academic Education: A fundamental understanding of the academic field of Remote Sensing, different learning areas and its applications

PLO2 Knowledge: Apply knowledge of remote sensing & GIS, for the solution of defined problems

PLO3 Problem Analysis: Demonstrate the ability to use skills in remote sensing & GIS and its related areas of technology for formulating and tackling remote sensing related problems.

PLO4 Design/ Development of Solutions: Plan and execute remote sensing related investigations, analyze and interpret data collected using appropriate methods to report accurately the findings of the investigations

PLO5 Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern remote sensing tools to complex processes, with an understanding of the limitations.

PLO6 Individual and Teamwork: Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.

PLO7 Communication: Communicate effectively with the GIS community and with society at large about activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PLO8 Professionalism and Society: Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional practices

PLO9 Ethics: Understand and commit to professional ethics, responsibilities, and norms of professional practice.

PLO10 Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a GIS professional.

Mapping of PLO'S and PEO'S

T. No	Programe Learning Outcomes (PLO's)	PEO's

		PEO 1	PEO 2	PEO 3
1	Academic Education	✓	✓	
2	Knowledge	✓	✓	
3	Problem Analysis	✓		
4	Design/ Development of Solutions	✓	✓	
5	Modern Tool Usage	✓		✓
6	Individual and Teamwork		✓	✓
7	Communication			✓
8	Professionalism and Society		✓	✓
9	Ethics		✓	✓
10	Life-long Learning			✓

BS Remote Sensing and GIS PROPOSED ROADMAP

HEC UG Policy				Existing (RS&GIS) Road Map		Proposed (RS&GIS) Road Map	
		CH	**No. of Courses**	Credit Hours	Courses	Credit Hours	Courses
General Education	Natural Sciences	3	1	6	2	6	2
	Social Sciences	2	1	3	1	2	1
	Arts and Humanities	2	1	6	2	2	1
	Expository Writing	3	1	6	2	3	1
	Functional English	3	1	3	1	3	1
	Quantitative Reasoning	6	2	6	2	6	2
	Ideology and Const. of Pak	2	1	3	1	2	1
	Islamiat	2	1	3	1	2	1
	Application of ICT	2+1	1	3	1	2+1	1
	Entrepreneurship	2	1	0	0	2	1
	Civics and Comm. Engage	2	1	0	0	2	1
	Total	30	12	36	12	30	12
Major	Diff. Courses	72	As per req.	75	25	84	28
Int. Disciplinary	Diff. Courses	12	4	12	4	12	4
Capstone Project	Thesis	3	NA	6	1	3	1
Field Experience/Internship	Field Visit	3	NA	6	2	3	1
	Total	120		135		132	

SUMMARY

HEC GUIDELINES	HEC UG POLICY 2023	PROPOSED ROADMAP
General Education Course: 13	30 Credit Hours	**30 Credit hours**
Major (Disciplinary) Requirements	Minimum 72 Credit Hours	**84 Credit Hours**
Interdisciplinary/allied courses: 04	12 Credit Hours	**12 Credit Hours**
Field Work Course: 01	3 Credit Hours	**03 Credit Hours**

Capstone Project: 01	3 Credit Hours	**03 Credit Hours**
Total	120-144 Credit Hours	**132 Credit Hours**

BS Remote Sensing & GIS

Semester I

Sr. No	Course code	Course Title	Credit Hour		Course code	Proposed Course Title	Credit Hours		Category as per HEC Policy	Remarks
			Theory	Lab			Theory	Lab		
1	PAK 102	Pakistan Studies	3	0		Ideology & Constitution of Pakistan	2	0	General Education (1) Ideology & Constitution of Pakistan	Replaced Pakistan Studies 1 CH reduced
2	RGS 103 RGL 103	Fundamentals of GIS Fundamentals of GIS Lab	2	1	RGS 103 RGL 103	Fundamentals of GIS Fundamentals of GIS Lab	2	1	Major (Disciplinary) Requirements	No change
3	ENG103	English I	3	0	ENG103	Functional English	3	0	General Education Functional English (2)	Replaced English I
4	MAT 105*	Mathematics	3	0	MAT 105*	Mathematics (for Pre-Med.)	3	0	Zero credit course (Quantitative Reasoning)	No change
5	CSC 105 CSL 105	Introduction to Computers and Programming Introduction to Computers and Programming Lab	2	1	CSC 105 CSL 105	Introduction to Computers and Programming Introduction to Computers and Programming Lab	2	1	General Education (3) (Application of Information and Communication Technologies)	No change
6	PHY 101 PHL 101	Physics Physics Lab	2	1	PHY 101 PHL 101	Physics Physics Lab	2	1	General Education 4 (Natural Sciences)	No change
7	ISL 102/ SOC 360	Islamic Studies /Ethics	2	0	ISL 102/ SOC 360	Islamic Studies /Ethics	2	0	General Education 5 (Islamic/Religious Studies)	Moved from second semester 1 CH reduced
8					ISL 107	Tajweed	Non-Credited 1 hour per week	0		
					Total Credit Hours		**16**			

*Academic credit hour of this course is zero but its contact hours, teaching materials and tuition fee are equal to a 3 credit hour course.

Semester II

Sr. No	Course code	Course Title	Credit Hour		Course code	Proposed Course Title	Credit Hours		Category as per HEC Policy	Remarks
			Theory	Lab			Theory	Lab		
1	ENG 104	English II	3	0	HSS 320	Technical Writing & Presentation Skills	3	0	General Education Expository Writing (6)	Existing (Replaced English II)
2	RGS 104 RGL 104	Physical Geography Physical Geography Lab	3	0	RGS 104 RGL 104	Physical Geography Physical Geography Lab	2	1	Major (Disciplinary) Requirements	Moved from semester I
3	MAT 115	Calculus & Analytic Geometry	3	0	MAT 115 *Pre-req: MAT 105*	Calculus & Analytic Geometry	3	0	Interdisciplinary (1)	Existing
4					GEO 201	Museology	2	0	General Education Arts & Humanities (7)	New Course added
5	RGS 105 RGL 105 *Pre req: RGS 104*	Fundamentals to Earth Science Fundamentals to Earth Science Lab	2	1	RGS 105 RGL 105 *Pre req: RGS 104*	Fundamentals to Earth Science Fundamentals to Earth Science Lab	2	1	Major (Disciplinary) Requirements	Existing
6	RGS 106 RGL 106 Pre-req: RGS 104	Introduction to Remote Sensing Introduction to Remote Sensing Lab	2	1	RGS 106 RGL 106 *Pre-req: RGS 104*	Introduction to Remote Sensing Introduction to Remote Sensing Lab	2	1	Major (Disciplinary) Requirements	Existing

					ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0		
					Total Credit Hours		**17**			

Semester III

Sr. No	Course code	Course Title	Credit Hours		Course code	Proposed Course Title	Credit Hours		Category as per HEC Policy	Remarks
			Theory	Lab			Theory	Lab		
1						Entrepreneurship	2	0	General Education Course 8 (Entrepreneurship)	New course
2	CHM 105 CHL 105	Chemistry Chemistry Lab	2	1	CHM 105 CHL 105	Chemistry Chemistry Lab	2	1	General Education Natural Science (9)	Existing
3	RGS 201 RGL 201 Pre req: CSC 103	Introduction to Cartography Introduction to Cartography Lab	2	1	RGS 201 RGL 201 *Pre req: CSC 103*	Introduction to Cartography Introduction to Cartography Lab	2	1	Major (Disciplinary) Requirements	Existing
4	RGS 202 RGL 202 *Pre req: RGS 104*	GPS & Surveying GPS & Surveying Lab	2	1	RGS 202 RGL 202 *Pre req: RGS 104*	GPS & Surveying GPS & Surveying Lab	2	1	Major (Disciplinary) Requirements	Existing
5	PSY 107	Introduction to Psychology	3	0	PSY 107	Introduction to Psychology	2	0	General Education Social Sciences (10)	Existing 1 CH reduced
6						Civic& Community Engagement	2	0	General Education Civic& Community Engagement (11)	New course added

					ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0		
					Total Credit Hours		**15**			

Semester IV

Sr. No	Course code	Course Title	Credit Hours		Course code	Proposed Course Title	Credit Hours		Category as per HEC Policy	Remarks
			Theory	Lab			Theory	Lab		
1	MAT 205	Statistics	3	0	MAT 205	Statistics	3	0	General Education Quantitative Reasoning (12)	Existing
2	RGS 315	Human Geography	3	0	RGS 315	Human Geography	3	0	Major (Disciplinary) Requirements	Existing
3	RGS 204 RGL 204 Pre-req: RGS 106	Introduction to Photogrammetry Introduction to Photogrammetry Lab	2	0	RGS 204 RGL 204 *Pre-req: RGS 106*	Introduction to Photogrammetry Introduction to Photogrammetry Lab	2	1	Major (Disciplinary) Requirements	Existing
4	RGS 206 RGL 206 Pre req: RGS 203	Database Management Systems Database Management Systems Lab	2	1	RGS 206 RGL 206 *Pre req: RGS 203*	Database Management Systems Database Management Systems Lab	2	1	Major (Disciplinary) Requirements	Existing
5	RGS 207 Pre req: RGS 106	Active Remote Sensing & Space Laws	3	0	RGS 207 *Pre req: RGS 106*	Active Remote Sensing & Space Laws	3	0	Major (Disciplinary) Requirements	Existing

6	RGL 251	Field Work and Report-I	1	2	RGL 251	Geospatial Field Work and Report-I	1	2	Lab/Field Work	Existing
					ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0		
					Total Credit Hours		**18**			

Semester V

Sr. No	**Course code**	**Course Title**	**Credit Hours**		**Course code**	**Proposed Course Title**	**Credit Hours**		**Category as per HEC Policy**	**Remarks**
			Theory	Lab			**Theory**	**Lab**		
1					GEO 326 GEL 326	Computing with MATLAB Computing with MATLAB, Lab	2	1	Interdisciplinary (2)	Existing (Shifted from Semester VII)
2	RGS 316 RGL 316 Pre req: RGS 207	Microwave & Hyper Spectral RS Microwave & Hyper Spectral RS Lab	2	1	RGS 316 RGL 316 *Pre req: RGS 207*	Microwave & Hyper Spectral RS Microwave & Hyper Spectral RS Lab	2	1	Major (Disciplinary) Requirements	Existing
3	RGS 317 Pre req: RGS 206	Spatial Decision Support Systems	3	0	RGS 317 *Pre req: RGS 206*	Spatial Decision Support Systems	3	0	Major (Disciplinary) Requirements	Existing
4	RGS 318 RGL 318 Pre req: RGS 201 RGS 203	Spatial Data Infrastructure & Visualization Spatial Data Infrastructure & Visualization Lab	2	1	RGS 318 RGL 318 *Pre req: RGS 201 RGS 203*	Spatial Data Infrastructure & Visualization Spatial Data Infrastructure & Visualization Lab	2	1	Major (Disciplinary) Requirements	Existing

5	RGS 319 RGL 319	Multidisciplinary Applications of GIS & RS Multidisciplinary Applications of GIS & RS Lab	2	1	RGS 319 RGL 319	Multidisciplinary Applications of GIS & RS Multidisciplinary Applications of GIS & RS Lab	2	1	Major (Disciplinary) Requirements	Existing
6	RGS 320	Geospatial Project Management	3	0	RGS 320	Geospatial Project Management	3	0	Major (Disciplinary) Requirements	Existing
					ISL 111	Understanding Quran-iv	Non credited 1 hour every week	0		
					Total Credit Hour		**18**			

Semester VI

Sr. No	**Course code**	**Course Title**	**Credit Hours**		**Course code**	**Proposed Course Title**	**Credit Hours**		**Category as per HEC Policy**	**Remarks**
			Theory	Lab			**Theory**	**Lab**		
1	GEO 425	Research Methodology	3	0	GEO 425	Research Methodology	3	0	Interdisciplinary (3)	Existing
2	RGS 330 RGL 330 Pre req: CSC 103	Web GIS Web GIS Lab	2	1	RGS 330 RGL 330 *Pre req: CSC 103*	Web GIS Web GIS Lab	2	1	Major (Disciplinary) Requirements	Existing
3	RGS 331 RGL 331 Pre-req: RGS 106	Digital Image Processing Digital Image Processing Lab	2	1	RGS 331 RGL 331 *Pre-req: RGS 106*	Digital Image Processing Digital Image Processing Lab	2	1	Major (Disciplinary) Requirements	Existing

4	RGS 332 Pre req: RGS 202	Satellite Navigation Systems	3	0	RGS 332 *Pre req:* *RGS 202*	Satellite Navigation Systems	3	0	Major (Disciplinary) Requirements	Existing
5	RGS 320	Geospatial Project Management	3	0	RGS 320	Geospatial Project Management	3	0	Major (Disciplinary) Requirements	Existing
6					RGS 360 RGL 360 Pre-req: RGS 318	Spatial Data Analysis Spatial Data Analysis Lab	2	1	Major (Disciplinary) Requirements	Existing (shifted from semester VII)
					ISL 112	Understanding Quran-v	Non credited 1 hour every week	0		
					Total Credit Hours		**18**			

Semester VII

Sr. No	**Course code**	**Course Title**	**Credit Hours**		**Course code**	**Proposed Course Title**	**Credit Hours**		**Category as per HEC Policy**	**Remarks**
			Theory	Lab			**Theory**	**Lab**		
1					RGS 453	GIS for Disaster Management	3	0	Major (Disciplinary) Requirements	Existing (Selected from list of Electives)
2	RGS 361 RGL 361 *Pre-req:*	Integrated Geospatial Technologies	2	1	RGS 361 RGL 361 *Pre-req:*	Integrated Geospatial Technologies Integrated Geospatial Technologies Lab	2	1	Major (Disciplinary) Requirements	Existing

	RGS 319	Integrated Geospatial Technologies Lab			*RGS 319*					
3					RGS 453 RGL 453	Geospatial Techniques Geospatial Techniques Lab	2	1	Major (Disciplinary) Requirements	New course added
4	ENV 425	Occupational Health & Safety	3	0	ENV 425	Occupational Health & Safety	3	0	Interdisciplinary (4)	Existing
5					RGS 454 RGL 454	Spatial Data Modelling Spatial Data Modelling Lab	2	1	Major (Disciplinary) Requirements	New course added
					ISL 113	Seerah-i	Non credited 1 hour every week	0		
					Total Credit Hours		**15**			

Semester VIII

Sr. No	**Course code**	**Course Title**	**Credit Hours**		**Course code**	**Proposed Course Title**	**Credit Hours**		**Category as per HEC Policy**	**Remarks**
			Theory	Lab			**Theory**	**Lab**		
1	RGS 471	Legal and Social Issues in Geospatial Sciences	3	0	RGS 471	Legal and Social Issues in Geospatial Sciences	3	0	Major (Disciplinary) Requirements	No change
2	RGS 451 RGL 451	Computer Aided Drafting/Drawing Computer Aided Drafting/Drawing Lab	2	1	RGS 451 RGL 451	Computer Aided Drafting/Drawing Computer Aided Drafting/Drawing Lab	2	1	Major (Disciplinary) Requirements	Existing (Selected from list of Electives)

3	RGS 455 RGL 455	Land & Water Information System Land & Water Information System Lab	2	1	RGS 455 RGL 455	Land & Water Information System Land & Water Information System Lab	2	1	Major (Disciplinary) Requirements	Existing (Selected from list of Electives)
4	RGS 453	Environmental Geography	2	1	RGS 456 RGL 456	GIS Programming & Python GIS Programming & Python Lab	2	1	Major (Disciplinary) Requirements	Existing (Selected from list of Electives)
5	RGS 490	Thesis	0	6	RGS 490	Cap stone project	0	3	Thesis	HEC
					ISL 114	Seerah-ii	Non credited 1 hour every week	0		
					Total Credit Hours		**15**			

Course Description of General Education and Foundation Courses for BS Remote Sensing & GIS

XX Ideology and Constitution of Pakistan (2 CH)
Historical background of Pakistan: Muslim society in Indo-Pakistan, the movement led by the societies, the downfall of Islamic society, the establishment of British Raj- Causes and consequences. Political evolution of Muslims in the twentieth century: Sir Syed Ahmed Khan; Muslim League; Nehru; Allama Iqbal: Independence Movement; Lahore Resolution; Pakistan culture and society, Constitutional and Administrative issues, Pakistan and its geopolitical dimension, Pakistan and International Affairs, Pakistan and the challenges ahead.

CSC 102 Introduction to Computers and Programming (2 CH)
History of Computer development; application of Computers; Classification and types of computers; Basic block diagram of computer; Hardware (input, output, memory, CPU and software (system software & Application software); social impact of computer age; Computer in education and Scientific research; Introduction to, and history of Internet; Internet service providers and connections; the World Wide Web. Problem solving and algorithm development. Computer hardware and software. Introduction to programming: machine, assembly and high level languages. C programming language. Arithmetic and logical statements, data types, input/output, basic control structures(selection, iteration etc).Array data type and usage of character strings. Functions: Callby-value and call-by-reference, scopes, recursion. Structures. Pointers. Bit manipulation. File processing.

CSL 102 Introduction to Computers and Programming Lab (1 CH)
Introduction to Microsoft Word, Excel, PowerPoint; Basic operations of Microsoft PowerPoint; Bibliography in MS Word; Graph plotting in MS Excel, Introduction to CorelDraw; Introduction to Adobe Photoshop; Structure of C; Input and output function of C++; Variable and Operators; Decision and Loops.

PHY 101 Physics (2 CH)
Newton's gravitation law; Kepler laws; Electro statistics; Magnetisms; Amperes law; Magnetic flux density B; Reflection and refraction interference and diffraction; Natural and artificial radioactivity; Heat and Conductivity; Pressure and Density; Thermodynamic Principles; Electricity and Magnetism; Semi-Conductor; Transistors; Satellite Communication; Introduction to Meteorology.

PHL 101 Physics Lab (1 CH)
Pratical lab work on Newton's gravitation law; Kepler laws; Electro statistics; Magnetisms; Amperes law; Magnetic flux density B; Reflection and refraction interference and diffraction; Natural and artificial radioactivity; Heat and Conductivity; Pressure and Density; Thermodynamic Principles; Electricity and Magnetism; Semi-Conductor; Transistors; Satellite Communication and Meteorology.

CHM 105 Chemistry (2 CH)
Periodic Table, chemical bonding: ionic, covalent, coordinate covalent bond.Solution chemistry. Surface chemistry. Colloids chemistry. Thermodynamics and chemical kinetics. General chemistry of functional groups of organic compounds (alcohols, carbonyls, esters, carboxylic acids, amines). Aromatic compounds, ions, radicals. Photochemical reactions.

Radioactivity. Weak Acids & Bases; Water Hardness; Redox Reactions, Chemical Kinetics; Radioactivity.

CHL 105 Chemistry Lab (1 CH)
Preparation of molar, molal, normal solutions and buffers. Osmosis and Diffusion. Measurement of pH, EC, DO and TDS in waste water. Use of titrimetric and gravimetric analysis. Use of spectrophotometric techniques. Paper Chromatography (one and two dimensional)

ENG 205 Technical Writing and Presentation Skills (3 CH)
Pre-requisite ENG 105
The Writing Process, Objectives in Technical Writing, Audience Recognition and Involvement, Criteria for Writing Reports, Summaries, Letters and Proposals, Research Paper Writing, Oral Communication, Writing Technical Descriptions, Instruction and User Manuals, The Job Search. Public Speaking & Presentation Skills, Meeting & Interviewing Skills, Non Verbal Communication, Project Reviewing.

XX Applications of Information and Communication Technologies (ICT) (2 CH)
Brief history of Computer, Four Stages of History, Computer Elements, Processor, Memory, Hardware, Software, Application Software its uses and Limitations, System Software its Importance and its Types, Types of Computer (Super, Mainframe, Mini and Micro Computer), Introduction to CBIS (Computer Based Information System), Methods of Input and Processing, Class2. Organizing Computer Facility, Centralized Computing Facility, Distributed Computing Facility, Decentralized Computing Facility, Input Devices. Keyboard and its Types, Terminal (Dump, Smart, Intelligent), Dedicated Data Entry, SDA (Source Data Automation), Pointing Devices, Voice Input, Output Devices. Soft- Hard Copies, Monitors and its Types, Printers and its Types, Plotters, Computer Virus and its Forms, Storage Units, Primary and Secondary Memories, RAM and its Types, Cache, Hard Disks, Working of Hard Disk, Diskettes, RAID, Optical Disk Storages (DVD, CD ROM), Magnetic Types, Backup System, Data Communications, Data Communication Model, Data Transmission, Digital and Analog Transmission, Modems, Asynchronous and Synchronous Transmission, Simplex. Half Duplex, Full Duplex Transmission, Communications, Medias (Cables, Wireless), Protocols, Network Topologies (Star, Bus, Ring), LAN, LAN, Internet, A Brief History, Birthplace of ARPA Net, Web Link, Browser, Internet Services provider and Online Services Providers, Function and Features of Browser, Search Engines, Some Common Services available on Internet.

XX Applications of Information and Communication Technologies Lab (ICT) (1 CH)
Practical exercises will be carried out in lab

XX Entrepreneurship (2 CH)
The Nature and Importance of Entrepreneurship: Nature and Development of Entrepreneurship; Entrepreneurial Decision Process; Role of Entrepreneurs in Economic development; Ethics and Social Responsibility of Entrepreneurship; The Future of Entrepreneurship The Entrepreneur and Entrepreneurial Mind: The Entrepreneurship process; Myths of Entrepreneurs, Managerial VS Entrepreneurial Decision Making; Entrepreneurial Leadership Characteristics The Nature and Importance of SMEs: Nature and Scope of Entrepreneurship; SMEs Definitions / Understanding by various Regulatory Authorities in Pakistan; SMEs contribution to GDP of any country, and of Pakistan; SMEDA' s Role in promoting and developing SMEs. The Individual Entrepreneur, and Techniques for Idea Generation Process; Entrepreneur VS Intrapreneur. Inside the Entrepreneurial Mind: From Ideas to reality: Creativity, Innovation and Entrepreneurship; Creativity A necessity for

survival; Creative Thinking; Barriers to creativity; How to enhance creativity; The creative Process; Techniques for improving the creative process; Protecting your ideas.The Customer and Product Plan/Feasibility: Understanding of Customer through Demand and Desire, and of Product (Good and/or Service) The Industry and Marketing Plan/Feasibility: Understanding of Marketing Plan, Characteristics of Marketing Plan; and Environment Analysis and Steps in preparing the Marketing Plan The Financial Plan/Feasibility: Operating and Capital Budgets, Break Even Analysis; Cash Flows and Balance Sheets The Organizational Plan/Feasibility: Developing the management team; Building the successful Organization, The Role of BODs. Components, and Classification of Business Plans Financing Options: e.g. Leveraged Buyouts; Preparing for the new Launch; Execution & Growth; Managing early growth of the New ventures. Analysis, and Competitive Environment Analysis. Growth Options: Joint Venture; Franchising; Acquisitions; Synergy; Mergers; Hostile Takeovers; Licencing etc.

XX Civics and Community Engagement (2 CH)

This course aims to bring responsible citizenship and active engagement between Universities/HEIs (through their students) and local communities. The course will provide students with a foundational understanding of the principles, institutions, and processes of civic engagement in a democratic society. Moreover, the course will build the capacity of students as leaders and influencers by gaining fundamental understanding of leadership, citizenship, communication, advocacy, network building as well as having first-hand experience of community development through volunteer works.

GEO 201 Museology (2 CH)

Introduction to Museology provides a broad, theory-based introduction to the museum sector and the research field of museology. Focusing on museum ethics, the course also give attention to all museum activities. Excursions to different museums and guest lectures from the museum sector give the students insights into the museum practice and provide present day examples and discussions, which they may study by using museological theories, dilemmas in museum ethics, and knowledge in museum history.

MAT 205 Statistics (3 CH)

Environmental models-deterministic and stochastic; generation of environmental data; types and objectives of environmental studies, stochastic processes in environment; Measurement scales; statistical descriptors of environmental data –numerical and graphical; measurement uncertainty – accuracy, precision and bias estimation of environmental data; variability and errors in environmental pollution data. Probability concepts; probability distribution functions and their applications-discrete and continuous distributions. Probability distribution applications-interpreting environmental standards, flood frequency analysis and air quality data.

Associate Degree Program Computer Science (ADP-CS)

KHAWAJA QASIM

Generic Structure for Computing Disciplines:

Areas	**Credit Hours**	**Courses**
Computing Core	29	8
Mathematics & Supporting Courses	12	4
General Education Requirement	30	12
Total	71	24

Program Roadmap

SEMESTER 1						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	GSC 114	Applied Physics	2	0	2	17
None	GSL 114	Applied Physics Lab	0	1	1	
None	CSC 114	Introduction to Information & Communication Technology	2	0	2	
None	CSL 114	Introduction to Information & Communication Technology Lab	0	1	1	
None	CSC 113	Computer Programming	3	0	3	
None	CSL 113	Computer Programming Lab	0	1	1	
None	GSC 221	Discrete Mathematics	3	0	3	
None	ISL 101	Islamic Studies/Ethics	2	0	2	
None	CSC 308	Professional Practices & Ethics	2	0	2	
None	ISL 107	Tajweed	Non-Credited 1 hour per week	0	0	
SEMESTER 2						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	GSC 122	Probability and Statistics	3	0	3	18
CSC 113	CSC 210	Object Oriented Programming	3	0	3	
CSC 113	CSL 210	Object Oriented Programming Lab	0	1	1	
GSC 114	CEN 122	Digital Design	2	0	2	
GSC 114	CEL 122	Digital Design Lab	0	1	1	
None	GSC 110	Applied Calculus and Analytical Geometry	3	0	3	
None	ENG 101	Functional English	3	0	3	
None	PAK 101	Pakistan Studies	2	0	2	
None	ISL 108	Understanding Quran-I	Non-credited 1 hour every week	0	0	
SEMESTER 3						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None	HSS 217	Introduction to Sociology	2	0	2	18
None	GSC 121	Linear Algebra	3	0	3	
GSC 110	GSC 211	Multivariable Calculus	3	0	3	
None	CEN 223	Computer Communication & Networks	3	0	3	
None	CEL 223	Computer Communication & Networks Lab	0	1	1	
CSC 113	CSC 221	Data Structure & Algorithm	3	0	3	

CSC 113	CSL 221	Data Structure & Algorithm Lab	0	1	1	
None	ENG 134	Communication Skills	2	0	2	
ISL 108	ISL 109	Understanding Quran-ii	Non credited 1 hour per week	0	0	
SEMESTER 4						
Prerequisite	**Course Code**	**Course Title**	**Theory**	**Lab**	**CR**	**CR/Sem**
None		Social Sciences Elective	3	0	3	
CEN 122	CEN 323	Computer Organization and Assembly Language	2	0	2	
CEN 122	CEL 323	Computer Organization & Assembly Language Lab	0	1	1	18
None	CSC 220	Database Management Systems	3	0	3	
None	CSL 220	Database Management Systems Lab	0	1	1	
SEN 220	SEN 321	Human Computer Interaction	2	0	2	
SEN 220	SEL 321	Human Computer Interaction Lab	0	1	1	
None	HSS 423	Entrepreneurship	2	0	2	
None	ENG 320	Technical Writing and Presentation Skills	3	0	3	
ISL 109	ISL 110	Understanding Quran-iii	Non credited 1 hour every week	0	0	

Conformance of PEC BEE Program with HEC UG Policy

HEC UG Policy				PEC BEE Curriculum				
Nomenclature		CH	No. of Courses	Domain	Knowledge Area	Sub Area	CH	No. of Courses
General Education	Natural Sciences	3	1	Non-Engineering	Natural Sciences	Physics	4	1
	Quantitative Reasoning	6	2			Math	12	4
						Elective	3	1
	Social Sciences	2	1		H&SS	Social Science	6	2
	Arts and Humanities	2	1					
	Functional English	3	1			English	7	3
	Expository Writing	3	1					
	Islamic Studies	2	1			Culture	4	2
	Ideology and Const. of Pak	2	1					
	Entrepreneurship	2	1		Management Science		5	2
	Civics and Comm. Engage	2	1					
	Application of ICT	2+1	1	Engineering	Computing	Intro. to Computing	2	1
	Total	**30**	**12**			**Total**	**43**	**16**
Major	Diff. Courses	72	-	Engineering		Electrical Engineering	75	23
Int. Disciplinary	Diff. Courses	12	4			IDEE	5	2
						Computing	7	2
Capstone Project	FYP	3	NA			Senior Design Project	6	2
Field Experience	Internship	3	NA			Internship	Graded, non-credited	
	Total	120	-			Total	136	43

Program	TCH	CH limit	Gen Ed	Major/ Disc	Interdisciplinary / Allied	Field/ Internship	Capstone project	Addtnl Major	Ad entry/Exit
BEE	136	130-136	Yes 43 CH (31 CH are covered in first 4 semesters)	Yes 75 CH	Yes 12 CH with IDEE and Computing domain courses	Yes (Graded non-credited)	Yes (6 CH)	No	Neither BU offers AD in EE nor PEC has such provision.

Conclusion: In general, the current curriculum of BEE program is in conformance with HEC UG policy.

Conformance of PEC BSE Program with HEC UG Policy

HEC UG Policy				PEC BSE Curriculum				
Nomenclature		CH	No. of Courses	Domain	Knowledge Area	Sub Area	CH	No. of Courses
General Education	Natural Sciences	3	1	Non-Engineering	Natural Sciences	Physics	3	1
	Quantitative Reasoning	6	2			Math	12	4
	Social Sciences	2	1			Social Science	4	2
	Arts and Humanities	2	1					
	Functional English	3	1			English	8	3
	Expository Writing	3	1					
	Islamic Studies	2	1		H&SS	Culture	4	2
	Ideology and Const. of Pak	2	1					
	Entrepreneurship	2	1		Management Science		5	2
	Civics and Comm. Engage	2	1					
	Application of ICT	2+1	1	Engineering	Computing & Information Sciences	Computing Fundamental	3	1
	Total	**30**	**12**			**Total**	**39**	**15**
Major	Diff. Courses	72	-			Engineering	78	24
						IDEE	7	3
Int. Disciplinary	Diff. Courses	12	4			Computing & Information Science	4	1
Capstone Project	FYP	3	NA			Senior Design Project	6	2
Field Experience	Internship	3	NA	Engineering		Internship	Graded, non-credited	
	Total	120	-			Total	134	45

Program	TCH	CH limit	Gen Ed	Major/ Disc	Interdisciplinary / Allied	Field/ Internship	Capstone project	Addtnl Major	Ad entry/Exit
BSE	134	130-136	Yes 39 CH (Only 29 CH are covered in first 4 semesters)	Yes 78 CH	Yes 11 CH with IDEE and Computing & Information Science domain courses (1 CH short in terms of HEC UG policy)	Yes (Graded non-credited)	Yes (6 CH)	No	Neither BU offers AD in SE nor PEC has such provision.

Conclusion: In general, the current curriculum of BSE program is in conformance with HEC UG policy except 1 CH is less in interdisciplinary courses and 1 CH short in completing 30 CH of general education within 4 semesters.

Conformance of PEC BCE Program with HEC UG Policy

HEC UG Policy				PEC BCE Curriculum				
Nomenclature		CH	No. of Courses	Domain	Knowledge Area	Sub Area	CH	No. of Courses
General Education	Natural Sciences	3	1	Non-Engineering	Natural Sciences	Physics	4	1
	Quantitative Reasoning	6	2			Math	17	6
	Social Sciences	2	1			Social Science	4	2
	Arts and Humanities	2	1					
	Functional English	3	1		H&SS	English	7	3
	Expository Writing	3	1					
	Islamic Studies	2	1			Culture	4	2
	Ideology and Const. of Pak	2	1					
	Entrepreneurship	2	1		Management Science		5	2
	Civics and Comm. Engage	2	1					
	Application of ICT	2+1	1	Engineering	Computer & Information Science	Computing Fundamental	3	1
	Total	**30**	**12**			**Total**	**44**	**17**
Major	Diff. Courses	72	-	Engineering		Engineering	72	19
Int. Disciplinary	Diff. Courses	12	4			IDEE	7	3
						Computer & Information Science	7	2
Capstone Project	FYP	3	NA			Senior Design Project	6	2
Field Experience	Internship	3	NA			Internship		Graded, non-credited
	Total	120	-			Total	136	43

Program	TCH	CH limit	Gen Ed	Major/ Disc	Interdisciplinary / Allied	Field/ Internship	Capstone project	Addtnl Major	Ad entry/Exit
BCE	136	130-136	Yes 39 CH (35 CH are covered in first 4 semesters)	Yes 72 CH	Yes 14 CH with IDEE and Computer & Information Science domain courses	Yes (Graded non-credited)	Yes (6 CH)	No	Neither BU offers AD in CE nor PEC has such provision.

Conclusion: In general, the current curriculum of BCE program is in conformance with HEC UG policy.