Academic Regulations

for

B.Tech. Degree Programmes (Except Agriculture)

SESSION: 2015-16

CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT, ODISHA

1. Academic Regulations & Policies

This section gives an overview of the different Academic Rules and Regulation. Specifically it contains information on Choice Based Credit System (CBCS), Registration, Selection of Courses, Time Table, Grading System, Examination Policy, Attendance Policy and Academic Rules applicable for CUTM. These rules may need to compliment by rules specific to different schools and/or programmes. Such rules will be provided separately to the students of respective schools.

1.1   Choice Based Credit System

The Choice Based Credit System (CBCS) is made available to all Engineering students(Excluding Agriculture).

- The student has a choice of picking a list of courses from a Basket of choices. This gives a student the flexibility to choose his/her subjects. Similarly, a student can also pace his academic planning as per his capacity.
- The Entire syllabus is divided into Baskets of subjects comprising of Foundation Courses in Sciences, Humanities & Management, Foundation Courses in Engineering, Core Engineering Courses and Open Electives.
- A Student can choose any subject of interest from any basket.
- There is no limitation on the number of courses to be registered in any semester. For the award of degree a student has to complete the requisite grades from each basket during 4 years of study.
- A Student can pursue any number of Practice / Theory Courses. The student can obtain a certificate of Skills competency for most of the Practice Courses.
- Number of minor projects can be carried out apart from industry internships which are accounted for the credits.
- Open On-line Courses (MOOCS) offered by any Premier Institute Globally can be opted by any student.

1.2   Structure of Choice Based Credit System

Basket	Basket Category	%	Credits to be acquired		
			Theory Courses	Practice Courses	Total Credits
I	Foundation Courses in Sciences	10			18
II	Foundation Courses in Humanities & Management	10			18
III	Foundation Courses in Engineering	15			27@
IV	Core Engineering Courses	25	27	18	45
V	Discipline Centric Elective Courses	40			72
	Total Credits				180

@ Students should invariably register all the subjects listed in Baskets IV for obtaining a degree in that branch and also the prerequisite subjects listed in Baskets IV of their branch.

1.2.1 Credit Weightages

Courses	Credits
Engineering Courses	3
Foundation Course in Sciences	3
Humanities & Management	2
Practice Course	2
Minor Project	3
Major Project	6
Internship(4Weeks)	2
CSR / NSS / NCC / SCOUT etc.	0

1.3   Registration, Selection of Courses & Time Table

This section gives the details of the University Registration Card, Registration to different subjects and Time Table for different Instructions.

1.3.1 University Registration Card

A Student is issued University Registration Card after admission process. University Registration number continues to be his / her Registration Number for all examinations during his / her tenure of study. This card is also essential for attending classes in a college

and appearing in examinations. This is the MOST IMPORTANT document and the student must take care of it. Duplicate University Registration Card will be issued only after recommendation by the Dean of respective college on paying the prescribed fee.

1.3.2   Subject-wise Registration

All registered students of the University have to register for each of the subjects they are required to study before commencement of a semester. A student has to apply in a specified format for subject wise registration for each semester with prescribed fees to his/her college Dean. The same will be scrutinized and registration confirmation will be displayed on the notice board and in MIS. The following methodology is adopted for registration procedure.

i. Head of the Departments are to give the titles of the subjects for all the Baskets.
ii. The MIS section has to upload all these subjects in the MIS.
iii. One week slot will be provided for counselling & registration in every semester for the students.
iv. When the students are admitted to first year, 20 students each to be allotted to individual faculty on the day the admission is finalized.
v. The faculty has to counsel the students assigned and ensure that all the students understand the CBCS and select the subjects of their interest and choice. This will happen during orientation and student registration in MIS is done. Colleges will prepare slots for students and their faculty guides for this purpose.
vi. The faculty concerned can make note of the subjects selected by his/her students and then the students are guided to freeze these in MIS.
vii. There is no restriction on the number of credits to be registered by any student.
   - A slow learner can go at slow pace, registering for very few credits, preferably from practice courses. This depends on the guidance available to him from HoD and other faculty.
   - However a fast learner can register for 30 or more credits in a semester which includes many add on courses from skill based courses and others. But he/she has to study all the 8 semesters picking up at least one/two subjects in each semester as Degree is offered for 4 years.
viii. A Student is allowed to register for a subject only after clearing its pre requisites, if any.
ix. After the suggested orientation and choice lock is over, the time table will be prepared. Care will be taken to accommodate maximum student choice. Wherever it is not possible, Student will be guided to change the choice.
x. If any student does not register during the given slot or joins the college later, then he/she will have to exercise choice based on the time table.
xi. Any such student will be advised to exercise his/her choice next semester.
xii. As we have a window in final year after exams and before convocation, so if any students fall short of credits, they can complete between April to November.
xiii. The MIS will be configured to the baskets. MIS will also show student credits till then registered under "My Credits". A report on student wise credits will also be generated.

1.3.3   Time Table for Instructions

Each constituent college will provide the Time Table for the subjects being offered in a semester after the subject registration of the semester. The time table is expected to indicate the name of the teacher who is handling the subject.

1.3.4   Duration of Curriculum and Calendar

- Each year shall be divided into two Semesters – Autumn Semester (July to December) and Spring Semester (January to June). The Autumn semester shall ordinarily begin in July for students already on rolls and the Spring semester shall ordinarily begin in January. However, the first semester (Autumn, for newly admitted students) may begin a little later depending on completion of admission process and formalities. The number of teaching weeks in each semester shall be 15 to 18 with a minimum of 90 teaching days excluding the period of examination.

- Each year the University shall draw out a calendar of academic and associated activities which shall be adhered to. Details of curricula and syllabi shall be as decided by the Academic Council with provision for modification from time to time as per the need of the specialization concerned.

- Duration: The duration of the programmes shall be governed by the regulations of AICTE that may change from time to time. As per the prevailing regulations, the duration of the B.Tech degree programmes is four years (8 semesters). A weaker student may complete the four year B.Tech degree programme in not more than eight (8) years.

1.4   Grading System & Degree Requirement

The University has adopted a ten points grading system, the details of which are as follows:

1.4.1   Categorization of Grades and Their Correlation

This section gives the details of the Grading system being followed by the University.

Qualification	Grade	Score on 100 Percentage Point	Point
Outstanding	'O'	90 & above up to 100	10
Excellent	'E'	80 & above but less than 90	9

Qualification	Grade	Score on 100 Percentage Point	Point
Very Good	'A'	70 & above but less than 80	8
Good	'B'	60 & above but less than 70	7
Fair	'C'	50 & above but less than 60	6
Pass	'D'	40 & above but less than 50	5
Failed	'F'	Below 40	2
Malpractice	'M'	---	0
Absent	'S'	---	0

N.B. *Grade C shall be considered as average, Grade D shall be pass Grade for theory and Grade C shall be Pass Grade for Practical / Sessional /Project.*

1.4.2 Definition of Terms

The terms used in the above table are defined as follows:

a) Point – Integer equivalent of each letter grade

b) Credit – Integer signifying the relative emphasis of individual course item(s) in a semester as indicated by the course structure and syllabus

c) Credit Point – (b) multiplied by (a) for each course item

d) Credit Index –Sum of Credit Points, [i.e Sum of (c)] of course items in a semester

e) Grade Point – (c) / (d)

f) Grade Point Average – Represented by Grade Point Indices as per section 1.4.3.

- Semester Grade Point Index (SGPI)

- Cumulative Grade Point Index (CGPI)

1.4.3   Grade Point Index

The formulas for calculating the SGPI and CGPI are as follows:

- **Semester Grade Point Index**

The formula for calculating SGPI is:
SGPI = (Credit Index) / (Sum of Credits for a Semester)

- **Cumulative Grade Point Index**

The formula for calculating CGPI is:
CGPI = (Sum of Credit Index of all previous Semester)/(Credits of all previous Semesters) up to a semester

1.4.4   B.Tech Degree Requirements

There shall be no class / division awarded to a student either at semester or degree level. A candidate will be eligible for award of B.Tech degree if he / she satisfies all the following conditions:

a) Has cleared all subjects with at least pass grade.
b) Has obtained requisite credits of his / her branch of study, which at present is 180.
c) Has obtained at least satisfactory grade in CSR activities(i.e. NCC/NSS/Games/Sports/Music/Debate/Quiz/Yoga) during the study period.
d) Has no due to the University / Library / Hostels etc.
e) Has no disciplinary action pending against him / her.

2. Examination Policy

The section on Examination Policy gives specific guidelines and rules on the Examination, expected Examination Code of Conduct and the Disciplinary Actions laid down for incidence of mal-practice during Examinations.

2.1   Eligibility for Examinations

The eligibility criteria for appearing in the examinations of CUTM are as follows:

- A student has to maintain overall 75% attendance to be able to write all papers at end semester examinations in a semester. The attendance is considered from the date of

commencement of classes as per academic calendar of the university and is calculated based on the total number of working days available in a semester.

- The schedule of classes shall be notified through a time table before the beginning of the classes in the Semester. Attendance record will be compiled at the time of each class test and the students with poor attendance will be informed through notification. The guardian may be informed through a letter/SMS. Letters will be issued to the student and the guardian before he/she is debarred for appearing at University examination due to shortage of attendance. University has to be informed about the percentage of attendance before starting the examination.

- Concessions: A student who has been absent for short periods on health ground or due to participation in cultural, sports, other academic / official assignments in the interest of the institution / college / university / government with prior written permission of the head of the institution / college shall be permitted a maximum of additional concession of 10% in attendance and would be eligible for appearing in examination with a minimum of 65% attendance in a semester.

- A student will be allowed to appear in the Semester Examination in those theory subjects where his/her attendance is not less than 65% in case he/she does not have 65% overall attendance.

- A candidate shall be allowed in a Semester Examination only after he/she is issued an Admit Card for the relevant examination by the college. The college shall obtain written clearance on eligibility from the University.

- Students who have been found to indulge in malpractice during examination will be awarded 'M' grade in that subject. The university may take any additional disciplinary action at its discretion. Such candidates will be allowed to appear in subsequent examinations based only on the decision of the University.

- A student who is absent in any subject(s) for which he/she has registered will be awarded 'S' grade. He/she is permitted to appear in those subjects in subsequent semester examinations after the due permission from the respective College and University.

- A student may register to appear in a semester examination which she/he has already appeared and passed / failed for improving his/her marks with a fee.

2.2   Evaluation System

The University has a continuous evaluation system for each theory, sessional, design, practical and project items. For this purpose the university holds the following examinations.

- End Semester Examinations at the end of the Odd Semester course work (1st/ 3rd/ 5th / 7th semesters)

- End Semester examinations at the end of Even Semester course work (2nd / 4th / 6th / 8th semesters)

- Special Supplementary / Improvement Examinations of seventh and eighth semesters, for the benefit of candidates who have completed the course work of all eight semesters and have backlogs only from seventh and eighth semesters, after the declaration of results of eighth semester.

- Examination on Demand: Any backlog/ improvements as registered by the students are conducted on Sundays, duly notified in advance.

2.2.1 Theory Papers

(a)   A theory paper will have 100 percentage points. The weightage for three class tests and the end semester examinations will be as follows:

- Internal - I of one hour duration   =   10 percentage points.
- Internal - II of one hour duration   =   10 percentage points.
- Internal - III of one hour duration   =   10 percentage points.
- Assignments / quiz / viva-voce /attendance   =   10 percentage points.
- End Semester External Examination of three hours duration   =   60 percentage points.

  Total   =   100 percentage points.

(b)   A candidate is deemed to clear (pass) a theory paper if he / she secures minimum 'D' grade in the End Semester Examinations and the three class tests along with Assignment/quiz/viva-voce/attendance taken together (i.e out of 100) based on "NORMALISED GRADING SYSTEM".

2.2.2 Practical/Sessional/Project

- Each of Practical/Sessional/Project paper will carry 100 percentage points out of which 50 percentage points internal & 50 percentage points external examinations.

- A student has to secure minimum of 50 percentage points to pass each paper.

- Each Practical/Sessional work is to be completed during allotted hours in the class itself.

- No sessional works can be done at home / hostel.

- The college may arrange a compensatory Practical/Sessional class for a student who misses an experiment on medical grounds, if it is satisfied of the reasons for absence.

3. General

3.1 The academic regulations should be read as a whole for the purpose of interpretation.

3.2 In case of doubt or ambiguity in the interpretation of the above regulations, the decision of the Vice-Chancellor is final.

3.3 The University may change or amend the academic regulations at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure

Electrical and Electronics Engineering

School of Engineering & Technology

2022

Course Structure

Basket - I

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Course Structure
Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Course Structure

Basket - III

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	d Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Course Structure
Basket - IV

Electrical and Electronics Engineering

Course Code	Course Title	Credits	Type T+P+PJ
CUTM1602	Programming in C	4	1-2-1
CUTM1603	Data Structures	4	1-2-1
CUTM1030	Advanced Web Programming	4	1-2-1
CUTM1031	Java Technologies	4	2-1-1
CUTM1039	Embedded System Design Using ARM Cortex	6	3-2-1
CUTM1040	VLSI Design	6	3-2-1
CUTM1042	Electromagnetic Field Theory and Transmission Line	3	2-1-0
CUTM1043	Network Analysis	3	2-1-0
CUTM1051	Energy Production & Transmission	3	2-1-0
CUTM1052	Substation Switch gear & Protection	4	2-1-1
CUTM1053	System Modeling and Control	4	3-1-0
CUTM1054	Electrical Machines Operation and Control	4	2-2-0
CUTM1055	Industrial Power Electronics	4	2-1-1
CUTM1056	Digital Measurement and Instrumentation	3	2-1-0
CUTM1057	Basic Electrical Engineering	2	1-1-0
	Total Credits	**58**	

Course Structure
Basket - V (Domain Track)

Industrial Automation

Code	Course Title	(Credit)	T-P-PJ
IACU2100	Industrial Automation	24	5-9-10

Course Code	Course Title	Credits	Type T-P-PJ
CUIA2100	Introduction to Industrial Automation	1	1-0-0
CUIA2101	Advanced Programming & Control Blocks of PLC	3	1-2-0
CUIA2102	Control & Signal Wiring of PLC	2	0-2-0
CUIA2103	SCADA based advanced features	2	1-1-0
CUIA2104	SCADA & PLC based sequential control	1	0-1-0
CUIA2105	Human Machine Interface	3	1-2-0
CUIA2106	OPC server base data fetching & control	2	1-1-0
CUIA2107	Project	6	0-0-6
CUIA2108	Internship	4	0-0-4
	Total Credits	**24**	

Operation and Maintenance of Electrical Grid System & Transformers

Domain Name	Code	Type of course	T-P-P	Pre-requisite
Operation and Maintenance of Electrical Grid System & Transformers	EGCU2090	Theory + Practice + Project	6-14-4	Nil

Course Code	Course Title	Credits	Type T-P-PJ
CUEG 2090	Introduction, Power Scenario, Power Quality & Faulty clearance	2	1-1-0
CUEG 2091	Switchyard & substation Networks	3	1-2-0

CUEG 2092	Protection scheme & Switchgear	3	1-2-0
CUEG 2093	Cable system & Testing	3	1-2-0
CUEG 2094	Power Markets	1	1-0-0
CUEG 2095	Grid Safety	2	0-2-0
CUEG 2096	Transformer Manufacturing	6	1-5-0
CUEG 2097	Project	4	0-0-4
	Total Credits	**24**	

Renewable Energy Applications

Code	Course Title	(Credit)	T-P-PJ
RECU2190	Renewable Energy Applications	22	4-8-10

Course Code	Course Title	Credits	Type T-P-PJ
CURE2190	Materials for Renewable Energy applications	2	1-1-0
CURE2191	Renewable Energy Technology for Industrial Process	3	1-2-0
CURE2192	Micro-grid Design & Implementation	2	0-2-0
CURE2193	Hybrid Renewable Energy Systems	3	1-2-0
CURE2194	Solar Off-grid Entrepreneur	2	1-1-0
CURE2195	project	6	0-0-6
CURE2196	Internship	4	0-0-4
	Total Credits	**22**	

Department of Physics
2021-22

CHOICE BASED CREDIT SYSTEM IN B.Sc. (Honours)

Semester	Basket-1	Basket-2	Basket -3	Basket-4	Basket-5	Semester wise cumulative credits
Semester	Core	Ability Enhancement	Domain	Discipline Specific Elective	Skill	
I	C 1 C 2	Environmental Science (02 Credit)	Domain Courses of Minimum 26 credits upto maximum of 36 credits.	G - 1	At least 04 skill courses of 16 credits	Minimum 24 Credits
II	C 3 C 4	JOB Readiness (English) (06 Credit)		G - 2		Minimum 24 Credits
III	C 5 C 6 C 7			G - 3		Minimum 24 Credits
IV	C 8 C 9 C 10			G - 4		Minimum 24 Credits
V	C 11 C 12					Minimum 24 Credits
VI	C 13 C 14					Minimum 24 Credits
					Total Credits	Minimum 140
* A student can opt more number ofDomain /GE coursesup to a maximum of 20 credits over the period of six semesters						Maximum 160

Department of Chemistry
2021-22

CHOICE BASED CREDIT SYSTEM IN B.Sc. (Honours)

Semester	Basket-1	Basket-2	Basket -3	Basket-4	Basket-5	Semester wise cumulative credits
Semester	Core	Ability Enhancement	Domain	Discipline Specific Elective	Skill	
I	C 1 C 2	Environmental Science (02 Credit)	Domain Courses of Minimum 26 credits upto maximum of 36 credits.	G - 1	At least 04 skill courses of 16 credits	Minimum 24 Credits
II	C 3 C 4	JOB Readiness (English) (06 Credit)		G - 2		Minimum 24 Credits
III	C 5 C 6 C 7			G - 3		Minimum 24 Credits
IV	C 8 C 9 C 10			G - 4		Minimum 24 Credits
V	C 11 C 12					Minimum 24 Credits
VI	C 13 C 14					Minimum 24 Credits
					Total Credits	Minimum 140
* A student can opt more number ofDomain /GE coursesup to a maximum of 20 credits over the period of six semesters						Maximum 160

Department of Mathematics
2021-22

CHOICE BASED CREDIT SYSTEM IN B.Sc. (Honours)

Semester	Basket-1	Basket-2	Basket -3	Basket-4	Basket-5	Semester wise cumulative credits
Semester	Core	Ability Enhancement	Domain	Discipline Specific Elective	Skill	
I	C 1	Environmental Science (02 Credit)	Domain Courses of Minimum 26 credits upto maximum of 36 credits.	G - 1	At least 04 skill courses of 16 credits	Minimum 24 Credits
	C 2					
II	C 3	JOB Readiness (English) (06 Credit)		G - 2		Minimum 24 Credits
	C 4					
III	C 5			G - 3		Minimum 24 Credits
	C 6					
	C 7					
IV	C 8			G - 4		Minimum 24 Credits
	C 9					
	C 10					
V	C 11					Minimum 24 Credits
	C 12					
VI	C 13					Minimum 24 Credits
	C 14					
Total Credits						Minimum 140
* A student can opt more number ofDomain /GE coursesup to a maximum of 20 credits over the period of six semesters						Maximum 160

Department of Botany
2021-22

CHOICE BASED CREDIT SYSTEM IN B.Sc. (Honours)

Semester	Basket-1	Basket-2	Basket -3	Basket-4	Basket-5	Semester wise cumulative credits
Semester	Core	Ability Enhancement	Domain	Discipline Specific Elective	Skill	
I	C 1	Environmental Science (02 Credit)	Domain Courses of Minimum 26 credits upto maximum of 36 credits.	G - 1	At least 04 skill courses of 16 credits	Minimum 24 Credits
	C 2					
II	C 3	JOB Readiness (English) (06 Credit)		G - 2		Minimum 24 Credits
	C 4					
III	C 5			G - 3		Minimum 24 Credits
	C 6					
	C 7					
IV	C 8			G - 4		Minimum 24 Credits
	C 9					
	C 10					
V	C 11					Minimum 24 Credits
	C 12					
VI	C 13					Minimum 24 Credits
	C 14					
					Total Credits	Minimum 140
* A student can opt more number ofDomain /GE coursesup to a maximum of 20 credits over the period of six semesters						Maximum 160

Department of Zoology
2021-22

CHOICE BASED CREDIT SYSTEM IN B.Sc. (Honours)

Semester	Basket-1	Basket-2	Basket -3	Basket-4	Basket-5	Semester wise cumulative credits
Semester	Core	Ability Enhancement	Domain	Discipline Specific Elective	Skill	
I	C 1	Environmental Science (02 Credit)	Domain Courses of Minimum 26 credits upto maximum of 36 credits.	G - 1	At least 04 skill courses of 16 credits	Minimum 24 Credits
	C 2					
II	C 3	JOB Readiness (English) (06 Credit)		G - 2		Minimum 24 Credits
	C 4					
III	C 5			G - 3		Minimum 24 Credits
	C 6					
	C 7					
IV	C 8			G - 4		Minimum 24 Credits
	C 9					
	C 10					
V	C 11					Minimum 24 Credits
	C 12					
VI	C 13					Minimum 24 Credits
	C 14					
					Total Credits	Minimum 140
* A student can opt more number ofDomain /GE coursesup to a maximum of 20 credits over the period of six semesters						Maximum 160

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN CLINICAL MICROBIOLOGY

2020

BACHELOR OF SCIENCE IN CLINICAL MICROBIOLOGY
Programme Structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	**Discipline Core Courses**	**Ability Enhancement Compulsory Course (AECC)** To be selected from University Basket	**Skill Courses** (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4 SC-5 SC-6 SC-7	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
28 Credits	**86 Credits**	**6 Credits**	**20 Credits**	**140 Credits (Minimum Credits required)**

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1713	Systemic Bacteriology	3+1+0	4
DC-5	CUTM1735	Systemic Virology & Mycology	3+2+0	5
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1740	Public Heath Microbiology	3+1+0	4
DC-9	CUTM1739	Pharmaceutical Microbiology	3+1+0	4
DC-10	CUTM1741	Industrial Microbiology	3+0+1	4
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1746	Epidemiology	2+0+1	3
DC-13	CUTM1747	Diagnostic Bacteriology	3+2+0	5
DC-14	CUTM1745	Diagnostic Mycology	3+1+0	4
DC-15	CUTM1743	Diagnostic Virology	3+0+1	4
DC-16	CUTM1744	Diagnostic Parasitology	3+1+0	4
DC-17	CUTM1754	Mini Project	0+0+2	2
DC-18	CUTM1755	Internship		12
DC-19	CUTM1756	Project		12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN EMERGENCY MEDICINE TECHNOLOGY

2021

BACHELOR OF SCIENCE IN EMERGENCY MEDICINE TECHNOLOGY

Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19 DC-20 DC-21 DC-22	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
18 Credits	**96 Credits**	**6 Credits**	**20 Credits**	**140 Credits (Minimum Credits required)**

BACHELOR OF SCIENCE IN EMERGENCY MEDICINE TECHNOLOGY

Basket 1

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1757	General Anatomy	3+2+0	5
SC-2	CUTM1758	General Physiology	3+2+0	5
SC-3	CUTM1732	Biochemistry	3+1+0	4
SC-4	CUTM1729	Cell Biology	3+0+1	4

Basket II

CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
CUTM1733	Microbiology	3-2-0	5
CUTM1839	Medical Terminology & Record keeping	2-0-1	3
CUTM1818	Basic principles of Hospital management	3-0-1	4
CUTM1862	Hospital and clinical pharmacy	3-2-0	5
CUTM1851	Introduction to emergency services- Part I	2-2-0	4
CUTM1852	Emergency Department Equipment Part - I	2-2-0	4
CUTM1853	Emergency Department Pharmacology Part-I	2-2-0	4
CUTM1742	Basic Computer and Information Science	0-2-0	2
CUTM1813	Pharmacology	3-0-1	4
CUTM1854	Introduction to emergency services - Part II	2-2-0	4
CUTM1855	Emergency department equipment -Part II	2-2-0	4

CUTM1856	Emergency Department Pharmacology-Part II	2-2-0	4

CUTM1807	Medical Psychology	2-0-1	3
CUTM1857	Psychiatric, Geriatric & Obstetric Emergencies	2-0-0	2
CUTM1858	Medical emergencies - Part I	3-1-0	4
CUTM1859	Medical emergencies- Part II	3-1-0	4
CUTM1751	Medical Laboratory Management	3-0-2	5
CUTM1753	Introduction to Quality and Patient Safety	3-0-2	5
CUTM1734	Medical Law and Ethics	2-0-1	3
CUTM1715	Clinical Pathology	3-1-0	4
CUTM1860	Project	12	12
CUTM1861	Internship	12	12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY

2020

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY
Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	
School Core Courses	**Discipline Core Courses**	**Ability Enhancement Compulsory Course (AECC)** To be selected from University Basket	**Skill Courses** (To be selected from University Basket)	**TOTAL CREDITS**
SC-1 SC-2 SC-3 SC-4 SC-5 SC-6 SC-7	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	**TOTAL CREDITS**
28 Credits	**86 Credits**	**6 Credits**	**20 Credits**	**140 Credits (Minimum Credits required)**

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1720	Histology	3+1+0	4
DC-5	CUTM1727	Advanced Hematology	3+1+0	4
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1749	Applied Haematology	3+2+0	5
DC-9	CUTM1750	Immunopathology	3+0+1	4
DC-10	CUTM1748	Parasitology	3+2+0	5
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1725	Blood Banking	3+0+1	4
DC-13	CUTM1751	Medical Laboratory Management	3+0+2	5
DC-14	CUTM1753	Introduction to Quality and Patient Safety	3+0+2	5
DC-15	CUTM1752	Mycology & Virology	3+2+0	5
DC-16	CUTM1754	Mini Project	0+0+2	2
DC-17	CUTM1755	Internship	-	12
DC-18	CUTM1755	Project	-	12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELORE OF SCIENCE IN MEDICAL RADIATION TECHNOLOGY

2020

BACHELOR OF SCIENCE IN MEDICAL RADIATION TECHNOLOGY

Programme Structure

BASKET - 1

School Core Courses

Sl.No.	SubjectCode	Subject	Subject Type (T - Pr- Pj)			Credits
SC-1	CUTM1757	General Anatomy	3	2	0	5
SC-2	CUTM1758	General Physiology	3	2	0	5
SC-3	CUTM1759	Basic Biochemistry	3	2	0	5
	CUTM1760	Biology				
SC-4	CUTM1729	Cell Biology	3	0	1	4
SC-4	CUTM1761	Mathematics	3	0	1	4
SC-4		**Total Credits**	3	0	1	**19**

BASKET – 2

Discipline Core Courses

Sl.No.	SubjectCode	Subject	SubjectType (T –Pr- Pj)			Credits
DC-2	CUTM1762	Basic Radiation Physics	3	0	1	4
DC-3	CUTM1763	Fundamental Medical Imaging	4	2	0	6
DC-4	CUTM1764	Principles of Radiation Therapy	3	0	1	4
DC-5	CUTM1765	Basic Medical Instrumentation & Technique	3	0	1	4
DC-6	CUTM1766	Applied Radiation Physics & Radiation Protection	3	0	1	4
DC-7	CUTM1767	Radiographic Technique - 1	3	2	0	5
DC-8	CUTM1768	Basic Equipment in Radiotherapy	3	0	1	4
DC-9	CUTM1769	Mammography and Ultrasound	3	0	1	4

DC-10	CUTM1770	Applied Equipment of Radio Diagnosis	3 0 1	4
DC-11	CUTM1771	Radiotherapy and Brachy Therapy inMalignant & Non-malignant Disease	3 0 1	4
DC-12	CUTM1772	Radiographic Technique - 2	3 2 0	5
DC-13	CUTM1773	Physics of CT & MRI	3 0 1	4
DC-14	CUTM1774	Interventional Radiology and DrugDiagnostic Radiology	3 2 0	5
DC-15	CUTM1775	Computerized Tomography (CT Scanning) Method & Procedure	3 0 1	4
DC-16	CUTM1776	Basic of Magnetic Resonance Imaging	301	4
DC-17	CUTM1777	Image Interpretation of X-RayMammography, CT & MRI	320	5
DC-18	CUTM1734	Medical Law and Ethics	2 0 1	3
DC-19	CUTM1778	Orientation in Clinical Sciences CourseContent	3 0 1	4
	CUTM1742	Basic Computer andInformation Science	0 2 0	2
DC-20	CUTM1779	Project	NA	18
DC-21	CUTM1780	Internship	NA	18

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR IN PHYSIOTHERAPY (B.P.T.)

2021

Bachelor in Physiotherapy
Programme structure

School Core Courses: 18 Credits

Discipline Core Courses: 160 Credits

Ability Enhancement Compulsory Course (AECC): 6 Credits

Skill Courses: 32 Credits

Total Credits: **216 Credits**

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1757	General Anatomy	3+2+0	5
SC-2	CUTM1758	General Physiology	3+2+0	5
SC-3	CUTM1732	Biochemistry	3+1+0	4
SC-4	CUTM1729	Cell Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1976	Electrotherapy-I	3+3+0	6
DC-2	CUTM1977	Exercise Therapy	3+2+0	5
DC-3	CUTM1978	Psychology and Sociology	5+0+2	7
DC-4	CUTM1979	Electrotherapy-II	3+3+0	6
DC-5	CUTM1715	Clinical Pathology	3+1+0	4
DC-6	CUTM1733	Microbiology	3+2+0	5
DC-7	CUTM1813	Pharmacology	3+0+1	4
DC-8	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-9	CUTM1980	Biomechanics and Kinesiology	5+0+1	6
DC-10	CUTM1981	Community Medicine	2+1+0	3
DC-11	CUTM1982	Physiotherapy in Cardio Pulmonary Condition	3+2+0	5

DC-12	CUTM1983	Principle of Rehabilitation	4+0+2	6
DC-13	CUTM1984	Paediatrics and Geriatrics	3+0+2	5
DC-14	CUTM1985	Surgery I	3+0+2	5
DC-15	CUTM1986	Medicine I (General Medicine)	3+0+2	5
DC-16	CUTM1987	Medicine II (Cardiology and Work Physiology)	3+1+0	4
DC-17	CUTM1988	Medicine III (Neurology)	3+1+2	6
DC-18	CUTM1989	General Orthopaedics	4+2+1	7
DC-19	CUTM1990	Surgery II	3+2+0	5
DC-20	CUTM1991	Medicine IV (Psychiatry)	3+0+2	5
DC-21	CUTM1721	Research Methodology	2+0+1	3
DC-22	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-23	CUTM1992	Physical Diagnosis and Physical Fitness	2+3+0	5
DC-24	CUTM1993	Yoga and Naturopathy	3+0+1	4
DC-25	CUTM1994	Physiotherapy in Medical Condition	3+2+0	5
DC-26	CUTM1995	Physiotherapy in Surgical Condition	3+1+1	5
DC-27	CUTM1996	Physiotherapy in Orthopaedics	3+2+0	5
DC-28	CUTM1997	Physiotherapy in Neurological Conditions	3+2+0	5
DC-29	CUTM1998	Internship		12
DC-30	CUTM1999	Project		12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the norms of the University.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN ANESTHESIA TECHNOLOGY

2021

BACHELOR OF SCIENCE IN ANAESTHESIA TECHNOLOGY
Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19 DC-20 DC-21	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
18 Credits	96 Credits	6 Credits	20 Credits	140 Credits (Minimum Credits required)

BACHELOR OF SCIENCE IN ANESTHESIA TECHNOLOGY

Basket 1

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1757	General Anatomy	3+2+0	5
SC-2	CUTM1758	General Physiology	3+2+0	5
SC-3	CUTM1732	Biochemistry	3+1+0	4
SC-4	CUTM1729	Cell Biology	3+0+1	4

Basket II

CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
CUTM1742	Basic Computer and Information Science	0+2+0	2
CUTM1734	Medical Law and Ethics	2+0+1	3
CUTM1815	Basics of Nursing	3+2+0	5
CUTM1814	Basics in Medical Physics & Electronics	3+0+1	4
CUTM1733	Microbiology	3+2+0	5
CUTM1816	Introduction to anesthesia and OT Technology	3+0+1	4
CUTM1813	Pharmacology	3+0+1	4
CUTM1820	Pharmacology related to Anesthesia Technology	3+0+1	4
CUTM1833	Clinical Hospital Practice for AT- I	0+4+0	4
CUTM1821	Concepts of Diseases and Techniques in Regional & General Anesthesia including Complications medical	3+0+1	4
CUTM1834	Clinical Hospital Practice for AT- II	0+4+0	4
CUTM1824	Anesthesia for Specialty Surgeries	3+0+1	4

CUTM1825	Anesthesia for Patients with Medical disorders	3+0+1	4
CUTM1835	Clinical Hospital Practice for AT- III	0+4+0	4
CUTM1828	Post Anesthesia care Unit	3+0+1	4
CUTM1829	Health Care Management	3+0+1	4
CUTM1822	Anesthesia Techniques Including Complication Same as OT	3+0+1	4
CUTM1827	Anesthesia for Specialties (Including Critical Care Assistance and Ventilation)- Paper II	3+ 0+1	4
CUTM1836	Clinical Hospital Practice for AT- 1V	0+4+0	4
CUTM1837	Internship		12
CUTM1838	Project		12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN OPTOMETRY

2020

BACHELOR OF SCIENCE IN OPTOMETRY

Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	TOTAL CREDITS
SC-1 SC-2 SC-3 SC-4	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19 DC-20 DC-21 DC-22 DC-23 DC-24 DC-25 DC-26 DC-27 DC-28	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5 SFS-6	TOTAL CREDITS
19 Credits	131 Credits	6 Credits	24 Credits	180 Credits (Minimum Credits required)

BASKET I
SchoolCoreCourses

Sl.No.	CODE	SUBJECT	SUBJECT TYPE(T+P+Pj)	CREDITS
SC-1	CUTM1760CUTM1761CUTM1729	BiologyMaths CellBiology	3+0+1	4
SC-2	CUTM1757	GeneralAnatomy	3+2+0	5
SC-3	CUTM1758	GeneralPhysiology	3+2+0	5
SC-4	CUTM1759	BasicBiochemistry	3+2+0	5

BASKETII
DisciplineCoreCourses

Sl.No	CODE	SUBJECT	SUBJECT TYPE(T+P+Pj)	CREDITS
DC-1	CUTM1781	GEOMETRIC OPTICS	3+2+0	5
DC-2	CUTM1742	BASICCOMPUTERAND INFORMATIONSCIENCE	0+2+0	2
DC-3	CUTM1782	OCULARANATOMY	3+1+0	4
DC-4	CUTM1783	OCULARPHYSIOLOGY	3+1+0	4
DC-5	CUTM1785	INTRODUCTIONTOOPTOMETRY	1+1+0	2
DC-6	CUTM1784	PHYSICALOPTICS	3+1+0	4
DC-7	CUTM1786	VISUALOPTICS–I	3+2+0	5
DC-8	CUTM1787	OPTOMETRICOPTICS–I	3+2+0	5
DC-9	CUTM1788	OCULARDISEASES–I	3+1+0	4
DC-10	CUTM1789	OCULARMICROBIOLOGY& PATHOLOGY	3+1+0	4
DC-11	CUTM1790	CLINICALEXAMINATIONOF VISUALSYSTEMLAB	0+2+0	2
DC-12	CUTM1791	VISUALOPTICS–II	3+2+0	5
DC-13	CUTM1792	OPTOMETRICOPTICS–II& DISPENCINGOPTICS	3+2+0	5
DC-14	CUTM1794	OCULARDISEASES–II	3+0+1	4
DC-15	CUTM1793	CONTACTLENSES-I	3+2+0	5
DC-16	CUTM1795	CONTACTLENSES-II	3+2+0	5
DC-17	CUTM1796	BINOCULARVISION–I	3+2+0	5

DC-18	CUTM1797	LOWVISION&REHABILITATION	3+1+0	4
DC-19	CUTM1798	BASIC & OCULARPHARMACOLOGY	3+0+1	4
DC-20	CUTM1799	BINOCULARVISION–II	3+2+0	5
DC-21	CUTM1800	PEDIATRIC & GERIATRICOPTOMETRY	3+1+0	4
DC-22	CUTM1801	SYSTEMICDISEASES &EYE	3+0+1	4
DC-23	CUTM1802	OCCUPATIONALOPTOMETRY	2+0+1	3
DC-24	CUTM1805	LAW&OPTOMETRY	2+0+1	3
DC-25	CUTM1804	PUBLIC HEALTH&COMMUNITYOPTOMETRY	2+1+0	3
DC-26	CUTM1803	OPTOMETRICINSTRUMENTS	3+1+0	4
DC-27	CUTM1809	PROJECT		18
DC-28	CUTM1810	INTERNSHIP		20

NOTE: Along with the School core and Disciple core subjects, the students need to opt

forAECCCourses,Skill/Domain/Electivecoursesandvalue- addedcoursesfromtheUniversityBasket,as

perthe requirementbytheUniversity

ValueAddedCourses:

Studentscanchooseanysuitableskillcourse offered bytheUniversityin semesterII/III/IVNote:Skillcourse

&Value-addedcourse,tobe optedbythestudentalongwith

theregularcourses, assuggestedinthesyllabus.

`CENTURION UNIVERSITY OF TECHNOLOGY

AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN OPERATION THEATRE TECHNOLOGY

2021

BACHELOR OF SCIENCE IN OPERATION THEATRE TECHNOLOGY

Course structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	**Discipline Core Courses**	**Ability Enhancement Compulsory Course (AECC)** To be selected from University Basket	**Skill Courses** (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19 DC-20 DC-21 DC-22	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
18 Credits	**96 Credits**	**6 Credits**	**20 Credits**	**140 Credits (Minimum Credits required)**

BACHELOR OF SCIENCE IN OPERATION THEATRE TECHNOLOGY

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1757	General Anatomy	3+2+0	5
SC-2	CUTM1758	General Physiology	3+2+0	5
SC-3	CUTM1732	Biochemistry	3+1+0	4
SC-4	CUTM1729	Cell Biology	3+0+1	4

BASKET II (Discipline Core Courses)

CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
CUTM1839	Medical Terminology and Record keeping	2+0+1	3
CUTM1742	Basic computer and Information Science	0+2+0	2
CUTM1734	Medical Law and Ethics	2+0+1	3
CUTM1753	Introduction to Quality and Patient safety	3+0+2	5
CUTM1840	Practical orientation on Community and Health care sector industry	2+0+1	3
CUTM1813	Pharmacology	3+0+1	4
CUTM1733	Microbiology`	3+2+0	5
CUTM1818	Basic principles of Hospital Management	3+0+1	4
CUTM1845	Clinical practices in hospital for OTT- I	0+4+0	4
CUTM1862	Hospital & Clinical Pharmacy	3+2+0	5
CUTM1816	Introduction to Anesthesia and OT Technology	3+0+1	4
CUTM1822	Anesthesia Techniques Including	3+0+1	4

	Complication		
CUTM1846	Clinical practices in hospital for OTT- II	0+4+0	4
CUTM1841	Basics of Surgical procedures	2+1+0	3
CUTM1814	Basics in Medical Physics & Electronics	3+0+1	4
CUTM1842	CSSD Procedures	2+1+0	3
CUTM1847	Clinical practices in hospital for OTT- III	0+4+0	4
CUTM1843	Advance surgical techniques	2+1+0	3
CUTM1844	Basic Intensive care	2+1+0	3
CUTM1848	Clinical practices in hospital for OTT- IV	0+4+0	4
CUTM1849	OTT Project		12
CUTM1850	OTT Internship		12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

Department of Chemistry
M.Sc. 2021-22
Semester Wise Course Structure

Semester	Basket-1	Basket-2	Basket -3	Semester wise cumulative credits
	CORE COURSE (16)=Total 64 Credit	**Domain** From Same/Related Discipline Minimum** (Total 20-32 Credits)	**Skill enhancement Courses**	
I	**C1 C2 C3 C4 C5**	Domain Course of minimum 20 credits up to a maximum of 32 credits	SEC - I	**Minimum 20 Credits**
II	**C6 C7 C8 C9 C10**			**Minimum 24 Credits**
III	**C11 C12 C13**		SEC - II	**Minimum 26 Credits**
IV	**C14 C15 C16**			**Minimum 26 Credits**
			Total Credit	**Minimum 96**
• A student can opt any of the one domain from domain basket offered by university depending on their stream/branch • A Student will opt one or more skill courses from Skill basket as per their credit requirement. • A non-credit value-added course will be opted by students during the two-year program				**Maximum 100**

Department of Mathematics
M.Sc. 2021-22
Semester Wise Course Structure

Semester	Basket-1	Basket-2	Basket -3	Semester wise cumulative credits
	CORE COURSE (16)=Total 64 Credit	**Domain**** **From Same/Related Discipline Minimum** (Total 20-32 Credits)	**Skill enhancement Courses**	
I	**C1 C2 C3 C4 C5**	Domain Course of minimum 20 credits up to a maximum of 32 credits	SEC - I	**Minimum 20 Credits**
II	**C6 C7 C8 C9 C10**			**Minimum 24 Credits**
III	**C11 C12 C13**		SEC - II	**Minimum 26 Credits**
IV	**C14 C15 C16**			**Minimum 26 Credits**
			Total Credit	**Minimum 96**
• A student can opt any of the one domain from domain basket offered by university depending on their stream/branch • A Student will opt one or more skill courses from Skill basket as per their credit requirement. • A non-credit value-added course will be opted by students during the two-year program				**Maximum 100**

Department of Physics
M.Sc. 2021-22
Semester Wise Course Structure

Semester	Basket-1	Basket-2	Basket -3	Semester wise cumulative credits
	CORE COURSE (16)=Total 64 Credit	Domain** From Same/Related Discipline Minimum (Total 20-32 Credits)	Skill enhancement Courses	
I	C1 C2 C3 C4 C5	Domain Course of minimum 20 credits up to a maximum of 32 credits	SEC - I	Minimum 20 Credits
II	C6 C7 C8 C9 C10			Minimum 24 Credits
III	C11 C12 C13		SEC - II	Minimum 26 Credits
IV	C14 C15 C16			Minimum 26 Credits
			Total Credit	Minimum 96
• A student can opt any of the one domain from domain basket offered by university depending on their stream/branch • A Student will opt one or more skill courses from Skill basket as per their credit requirement. • A non-credit value-added course will be opted by students during the two-year program				Maximum 100

Department of Zoology
M.Sc. 2021-22
Semester Wise Course Structure

Semester	Basket-1	Basket-2	Basket -3	Semester wise cumulative credits	
	CORE COURSE (16)=Total 64 Credit	Domain** From Same/Related Discipline Minimum (Total 20-32 Credits)	Skill enhancement Courses		
I	C1 C2 C3 C4 C5	Domain Course of minimum 20 credits up to a maximum of 32 credits	SEC - I	Minimum 20 Credits	
II	C6 C7 C8 C9 C10			Minimum 24 Credits	
III	C11 C12 C13		SEC - II	Minimum 26 Credits	
IV	C14 C15 C16			Minimum 26 Credits	
			Total Credit	Minimum 96	
- A student can opt any of the one domain from domain basket offered by university depending on their stream/branch - A Student will opt one or more skill courses from Skill basket as per their credit requirement. - A non-credit value-added course will be opted by students during the two-year program				Maximum 100	

Department of Botany
M.Sc. 2021-22
Semester Wise Course Structure

Semester	Basket-1	Basket-2	Basket -3	Semester wise cumulative credits
	CORE COURSE (16)=Total 64 Credit	**Domain** From Same/Related Discipline Minimum** (Total 20-32 Credits)	**Skill enhancement Courses**	
I	**C1 C2 C3 C4 C5**	Domain Course of minimum 20 credits up to a maximum of 32 credits	SEC - I	**Minimum 20 Credits**
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III	**C11 C12 C13**		SEC - II	**Minimum 26 Credits**
IV	**C14 C15 C16**			**Minimum 26 Credits**
			Total Credit	**Minimum 96**
- A student can opt any of the one domain from domain basket offered by university depending on their stream/branch - A Student will opt one or more skill courses from Skill basket as per their credit requirement. - A non-credit value-added course will be opted by students during the two-year program				**Maximum 100**

School of Pharmacy and Life Sciences

ELECTIVES COURSE STRUCTURE & SYLLABUS

B. Pharm. Degree Programmes

CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

Ramchandrapur, Jatni, Bhubaneswar Dist, Khurda Odisha-752050

www.cutm.ac.in

AY: 2017-18

ELECTIVE SUBJECTS

Course of study for semester-VIII

Course Code	Name of the Course	No. of hours	Tutorial	Credit Points
BPHT4203	Pharma Marketing Management	3	1	4
BPHT4204	Pharmaceutical Regulatory Science	3	1	4
BPHT4205	Pharmacovigilance	3	1	4
BPHT4206	Quality Control and Standardizations of Herbals	3	1	4
BPHT4207	Computer Aided Drug Design	3	1	4
BPHT4208	Cell and Molecular Biology	3	1	4
BPHT4209	Cosmetic Science	3	1	4
BPHL4201	Experimental Pharmacology	3	1	4
BPHL4202	Advanced Instrumentation Techniques	3	1	4
BPHT4212	Dietary Supplements and Nutraceutical	3	1	4

Semester VIII

Course Code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Marks	Exam Duration	Total	Marks	Duration	
BPHT4201	Biostatistics and Research Methodology	10	15	1 Hr	25	75	3 Hrs	100
BPHT4202	Social and Preventive Pharmacy	10	15	1 Hr	25	75	3 Hrs	100
BPHT4203	Pharmaceutical Marketing	10+10=20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BPHT4204	Pharmaceutical Regulatory Science							
BPHT4205	Pharmacovigilance							
BPHT4206	Quality Control and Standardizations of Herbals							
BPHT4207	Computer Aided Drug Design							
BPHT4208	Cell and Molecular Biology							
BPHT4209	Cosmetic Science							
BPHT4210	Experimental Pharmacology							
BPHT4211	Advanced Instrumentation Techniques							
BPHT4212	Dietary supplements and Nutraceuticals							
BPHP4201	Project Work	-	-	-	-	150	4 Hrs	150
	TOTAL	40	60	4 Hrs	100	450	21 Hrs	550

* The subject experts at college level shall conduct examinations

45 Hours

Scope:
The pharmaceutical industry not only needs highly qualified researchers, chemist, technical people but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. Sales & Marketing which grooms the people for taking a challenging role in Sales and Product management. The career in product management starts from having hands on experience in sales and marketing only.

Course Objective: The course aim is to provide an understanding of marketing concepts and techniques and the application of the same in the pharmaceutical industry

Unit I **10 Hours**
Marketing: Definition, general concepts, and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

Pharmaceutical market:
Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting.Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist.Analyzing the Market;Role of market research.

Unit II **10 Hours**
Product decision:
Meaning, Classification, product line and product mix decisions, product life cycle,product portfolio analysis; product positioning; New product decisions; Product branding, packagingand labeling decisions, Product management in pharmaceutical industry.

Unit III **10 Hours**
Promotion:
Meaning and methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

Unit IV **07 Hours**
Pharmaceutical marketing channels:
Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):
Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

Unit V **08 Hours**
Pricing:
Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).
Emerging concepts in marketing:
Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

Recommended Books: (Latest Editions)

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

BPHT4204.PHARMACEUTICAL REGULATORY SCIENCE (Theory)

45Hours

Scope: This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, drug products in regulated countries like US, EU, Japan, Australia and Canada. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products in regulated countries.

Objectives: Upon completion of the subject student shall be able to;
1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

Course content:

Unit I   **10Hours**
New Drug Discovery and development
Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

Unit II   **10Hours**
Regulatory Approval Process
Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA) in US. Changes to an approved NDA / ANDA.
Regulatory authorities and agencies
Overview of regulatory authorities of United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

Unit III   **10Hours**
Registration of Indian drug product in overseas market
Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.

Unit IV   **08Hours**
Clinical trials
Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

Unit V   **07Hours**
Regulatory Concepts
Basic terminologies, guidance, guidelines, regulations, laws and acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

Recommended books (Latest edition):

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.185. Informa Health care Publishers.

3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng

BPHT4205.PHARMACOVIGILANCE (Theory)

45 hours

Scope: This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.

Objectives:

At completion of this paper it is expected that students will be able to (know, do, and appreciate):

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI)
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality.

Course Content

Unit I   **10 Hours**

Introduction to Pharmacovigilance

- History and development of Pharmacovigilance
- Importance of safety monitoring of Medicine
- WHO international drug monitoring programme
- Pharmacovigilance Program of India (PvPI)

Introduction to adverse drug reactions

- Definitions and classification of ADRs
- Detection and reporting
- Methods in Causality assessment
- Severity and seriousness assessment
- Predictability and preventability assessment
- Management of adverse drug reactions

Basic terminologies used in pharmacovigilance

- Terminologies of adverse medication related events
- Regulatory terminologies

Unit II   **10 hours**

Drug and disease classification

- Anatomical, therapeutic and chemical classification of drugs
- International classification of diseases
- Daily defined doses

- International Non proprietary Names for drugs

Drug dictionaries and coding in pharmacovigilance
- WHO adverse reaction terminologies
- MedDRA and Standardised MedDRA queries
- WHO drug dictionary
- Eudravigilance medicinal product dictionary

Information resources in pharmacovigilance
- Basic drug information resources
- Specialised resources for ADRs

Establishing pharmacovigilance programme
- Establishing in a hospital
- Establishment & operation of drug safety department in industry
- Contract Research Organisations (CROs)
- Establishing a national programme

Unit III   **10 Hours**
Vaccine safety surveillance
- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

Pharmacovigilance methods
- Passive surveillance – Spontaneous reports and case series
- Stimulated reporting
- Active surveillance – Sentinel sites, drug event monitoring and registries
- Comparative observational studies – Cross sectional study, case control study and cohort study
- Targeted clinical investigations

Communication in pharmacovigilance
- Effective communication in Pharmacovigilance
- Communication in Drug Safety Crisis management
- Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

Unit IV   **8 Hours**
Safety data generation
- Pre clinical phase
- Clinical phase
- Post approval phase

ICH Guidelines for Pharmacovigilance
- Organization and objectives of ICH
- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmacovigilance planning

- Good clinical practice in pharmacovigilance studies

Unit V   **7 hours**

Pharmacogenomics of adverse drug reactions
- Genetics related ADR with example focusing PK parameters.

Drug safety evaluation in special population
- Paediatrics
- Pregnancy and lactation
- Geriatrics

CIOMS
- CIOMS Working Groups
- CIOMS Form

CDSCO (India) and Pharmacovigilance
- D&C Act and Schedule Y
- Differences in Indian and global pharmacovigilance requirements

Recommended Books (Latest edition):
1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance:Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller,Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert,Jones& Bartlett Publishers.
7. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy,Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills:G. Parthasarathi, Karin NyfortHansen,Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal
11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna
12. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
13. http://www.ich.org
14. http://www.cioms.ch
15. http://cdsco.nic.in
16. http://www.who.int/vaccine_safety/en
17. http://www.ipc.gov.in/PvPI/pv_home.html

BPHT4206.QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)

Scope: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Objectives: Upon completion of the subject student shall be able to;
1. know WHO guidelines for quality control of herbal drugs
2. know Quality assurance in herbal drug industry
3. know the regulatory approval process and their registration in Indian and international markets
4. appreciate EU and ICH guidelines for quality control of herbal drugs

Unit I   **10 hours**
Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms
WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use

Unit II   **10 hours**
Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine.
WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants

Unit III   **10 hours**
EU and ICH guidelines for quality control of herbal drugs.
Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

Unit IV   **08 hours**
Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.
Preparation of documents for new drug application and export registration
GMP requirements and Drugs & Cosmetics Act provisions.

Unit V   **07 hours**
Regulatory requirements for herbal medicines.
WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems
Comparison of various Herbal Pharmacopoeias.
Role of chemical and biological markers in standardization of herbal products

Recommended Books: (Latest Editions)
1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO

Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.

9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.

10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.

11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.

12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

BPHT4207.COMPUTER AIDED DRUG DESIGN (Theory)

45 Hours

Scope: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

Objectives: Upon completion of the course, the student shall be able to understand
- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

Course Content:
UNIT-I
10 Hours
Introduction to Drug Discovery and Development
Stages of drug discovery and development
Lead discovery and Analog Based Drug Design
Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.
Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

UNIT-II
10 Hours
Quantitative Structure Activity Relationship (QSAR)
SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III
10 Hours
Molecular Modeling and virtual screening techniques
Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,
Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design

UNIT-IV
08 Hours
Informatics & Methods in drug design
Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V
07 Hours
Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Recommended Books (Latest Editions)

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
5. Koro lkovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
6. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York

45 Hours

Scope:
- Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
- This is done both on a microscopic and molecular level.
- Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organismssuch as humans, plants, and sponges.

Objectives: Upon completion of the subject student shall be able to;
- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetics mechanisms.
- Summarize the Cell Cycle

Course content:

Unit I   **10Hours**
- a   Cell and Molecular Biology: Definitions theory and basics and Applications.
- b   Cell and Molecular Biology: History and Summation.
- c   Theory of the Cell? Properties of cells and cell membrane.
- d   Prokaryotic versus Eukaryotic
- e   Cellular Reproduction
- f   Chemical Foundations – an Introduction and Reactions (Types)

Unit II   **10 Hours**
- a   DNA and the Flow of Molecular Structure
- b   DNA Functioning
- c   DNA and RNA
- d   Types of RNA
- e   Transcription and Translation

Unit III   **10 Hours**
- a   Proteins: Defined **and** Amino Acids
- b   Protein Structure
- c   Regularities in Protein Pathways
- d   Cellular Processes
- e   Positive Control and significance of Protein Synthesis

Unit IV   **08 Hours**
- a   Science of Genetics
- b   Transgenics and Genomic Analysis
- c   Cell Cycle analysis
- d   Mitosis and Meiosis
- e   Cellular Activities and Checkpoints

Unit V   **07 Hours**
   a   Cell Signals: Introduction
   b   Receptors for Cell Signals
   c   Signaling Pathways: Overview
   d   Misregulation of Signaling Pathways
   e   Protein-Kinases: Functioning

Recommended Books (latest edition):
   1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
   2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
   3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
   4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
   5. Rose: Industrial Microbiology.
   6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
   7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
   8. Peppler: Microbial Technology.
   9. Edward: Fundamentals of Microbiology.
   10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
   11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
   12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
   13. RA Goldshy et. al., : Kuby Immunology

45Hours

UNIT I
10Hours

Classification of cosmetic and cosmeceutical products
Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application
Skin: Basic structure and function of skin.
Hair: Basic structure of hair. Hair growth cycle.
Oral Cavity: Common problem associated with teeth and gums**.**

UNIT II
10 Hours

Principles of formulation and building blocks of skin care products:
Face wash, Moisturizing cream, Cold Cream, Vanishing cream their relative skin sensory, advantages and disadvantages.Application of these products in formulation of cosmecuticals.
Antiperspants & deodorants- Actives & mechanism of action.
Principles of formulation and building blocks of Hair care products:
Conditioning shampoo, Hair conditioners, antidandruff shampoo.
Hair oils.
Chemistry and formulation of Para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT III
10 Hours

Sun protection, Classification of Sunscreens and SPF.
Role of herbs in cosmetics:
Skin Care: Aloe and turmeric
Hair care: Henna and amla.
Oral care: Neem and clove
Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste**.**

UNIT IV
08 Hours

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps,and syndet bars. Evolution and skin benefits.

UNIT V
07 Hours

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.
Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

References
1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.

BPHT4210.EXPERIMENTALPHARMACOLOGY (Theory)

45 Hours

Scope: This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

Objectives

Upon completion of the course the student shall be able to,

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in preclinical research
- Appreciate and demonstrate the importance of biostatistics and researchmethodology
- Design and execute a research hypothesis independently

Unit –I   08 Hours
Laboratory Animals:

Study of CPCSEA   and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

Unit –II   10 Hours
Preclinical screening models

a. **Introduction:** Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.

b. **Study of screening animal models for**
   Diuretics, nootropics, anti-Parkinson's,antiasthmatics,

Preclinical screening models: for CNS activity- analgesic, antipyretic,anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease

Unit –III   10 Hours
Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics

Unit –IV   07 Hours
Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.

Unit –V   10 Hours
Research methodology and Bio-statistics

Selection of research topic, review of literature, research hypothesis and study design

Pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA. Graphical representation of data.

Recommended Books (latest edition):

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

BPHT4211.ADVANCED INSTRUMENTATION TECHNIQUES (Theory)
45 Hours

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to
- understand the advanced instruments used and its applications in drug analysis
- Understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- Know analysis of drugs using various analytical instruments.

Course Content
Unit –I   **10 Hours**
Nuclear Magnetic Resonance spectroscopy
Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry - Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

UNIT-II   **10 Hours**
Thermal Methods of Analysis: Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray Crystallography, rotating crystal technique, single crystal diffraction,powder diffraction, structural elucidation and applications.

UNIT-III   **10 Hours**
Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments
Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC

UNIT-IV   **08 Hours**
Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques:General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

UNIT-V   **07 Hours**
Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.K Sharma

2. Organic spectroscopy by Y.R Sharma

3. Text book of Pharmaceutical Analysis by Kenneth A. Connors

4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel

5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake

6. Organic Chemistry by I. L. Finar

7. Organic spectroscopy by William Kemp

8. Quantitative Analysis of Drugs by D. C. Garrett

9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi

10. Spectrophotometric identification of Organic Compounds by Silverstein

BPHT4212 DIETARY SUPPLEMENTS AND NUTRACEUTICALS

No. of hours :3   **Tutorial:1**   **Credit point:4**

Scope :

This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.

Objective:

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to:

1. Understand the need of supplements by the different group of people to maintain healthy life.

2. Understand the outcome of deficiencies in dietary supplements.

3. Appreciate the components in dietary supplements and the application.

4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

UNIT I   **07 hours**

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.

b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.

c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits

of following used as nutraceuticals/functional foods: Spirulina,

Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT II 15 hours

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin

b) Sulfides: Diallyl sulfides, Allyl trisulfide.

c) Polyphenolics: Reservetrol

d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones

e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum

f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans

g) Tocopherols

h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

UNIT III 07 hours

a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free

radicals in cells, damaging reactions of free radicals on lipids, proteins,

Carbohydrates, nucleic acids.b) Dietary fibres and complex carbohydrates as functional food

ingredients..

UNIT IV 10 hours

a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer,

Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage.

Free radicals involvement in other disorders. Free radicals theory of ageing.

b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant

defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin

E, α- Lipoic acid, melatonin Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy

Anisole.

c) Functional foods for chronic disease prevention

UNIT V 06 hours

a) Effect of processing, storage and interactions of various environmental factors on the

potential of nutraceuticals.

b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food

Safety. Adulteration of foods.

c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

References:

1. Dietetics by Sri Lakshmi

2. Role of dietary fibres and neutraceuticals in preventing diseases by K.T Agusti and

P.Faizal: BSPunblication.

3. Advanced Nutritional Therapies by Cooper. K.A., (1996).

4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).

5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2nd Edn.,

Avery Publishing Group, NY (1997).

6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.

7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.

8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good

Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional*

Foods M.K. Sachmidl and T.P. Labuza eds. Aspen Press.

9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)

10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth

edition. Lea and Febiger

School of Applied Sciences

Centurion University of Technology & Management

M. Sc. GEOINFORMATICS

(**Two years programme**)

Course Introduced: 2021

Syllabus Edited: 2022

Overview

Several aspects of space technology have already touched the life of common people, e.g., Google Earth, GPS-enabled Mobiles and day-to-day navigation, using maps. All the technologies behind these services, when put in one basket, can be justifiably described as "Geoinformatics". This includes satellite remote sensing, airborne remote sensing, photogrammetry, geographical information system (GIS), Global Positioning System (GPS), electronic surveying, laser scanning, mobile mapping, image processing, algorithms, data structures and computer programming. Geoinformatics or Geospatial technology touches around 80% of human activities knowingly or unknowingly.

Geoinformatics have high potential for better management and monitoring of day-to-day activities and short-term and long-term physical processes that affect our living environment. Besides finding the use in the day-to-day life of people, these technologies are becoming essential for a large number of application domains, e.g., environmental sciences, civil engineering, urban development and management, water resource, geology, navigation, disaster management, forest, coastal zones, mining operations, entertainment, and many more. Geomatics encompasses the practices related to developing, managing, interpreting or analysing geographically referenced data and includes everything that is 'spatial' in its characteristic and content. Geospatial information empowers the nation to understand its topography, natural resources and human capital and allows it to develop the requisite industrial policies to harness its resources.

Objective:

The 2-year master degree course – M. Sc. Geoinformatics is an interdisciplinary course with an aim to meet the increasing demand for qualified manpower in this rapidly developing field encompassing both pure and applied sciences. Application of Remote Sensing techniques using Geographic Information System (GIS) and Global Positioning System (GPS) with advance surveying has its place in various activities such as resources monitoring and evaluation, environmental monitoring and land use/land cover mapping etc. RS data products are increasingly being used for designing of plan at all the levels of nation building. The department has a separate vision for this course in becoming a Centre of excellence in Geomatics education and research thus to match the needs of ever increasing requirement of trained manpower in these fields and to cater

to the need of the human society. It is our mission to impart quality education to students supported by large-scale hands- on-activity that could make them capable of handling challenges of modern technologies and also to maintain super specialized research facilities to go hand in hand with the world's leading universities and research institutions.

Eligibility:

Bachelor degree in any Science graduate or BA in Geography.

Minimum 40% mark in bachelor degree

Carrier Prospective:

♦ **Indian Space Research Organization (ISRO) -** [Space Application Centre (SAC), Indian Institute of Remote Sensing (IIRS), ISRO State application Centre, Orissa Space Application Centre (ORSAC)].
♦ Survey of India (SOI)
♦ Indian Rice Research Institute (IRRI)
♦ Defence Research & Development Organization (DRDO)
♦ Urban Authorities of India
♦ Forest department [Odisha Forest Sector Development Project (OFSDP)]
♦ Chilika Development Authority (CDA)
♦ Odisha PVTG Empowerment Livelihood Improvement Programme
♦ Odisha Tribal Empowerment & Livelihoods Programme Plus
♦ Odisha State Disaster Management Authority (OSDMA)
♦ Bhubaneswar Municipality Corporation (BMC)
♦ Indian Institute of Mineral and Material Technology (IMMT)
♦ AABSys
♦ Institute for Spatial Planning and Community E-services (I SPACE)

Award

After finishing the course, the student will be award as **"Master of Science in Geoinformatics"** in his / her certificate.

SYLLABUS AS PER CBCS STRUCTURE

M.Sc. GEOINFORMATICS

		CORE SUBJECT		
Sl. No.	**Code**	**Subject Name**	**T-P-P**	**Credits**
1.	CUTM2369	SURVEYING TECHNIQUES	**1-2-0**	**3**
2.	CUTM1060	GEOMETRIC MODELING	**0-3-0**	**3**
3.	CUTM2076	GEOSPATIAL DATA ANALYSIS IN PYTHON	**2-3-1**	**6**
4.	CUTM1059	DATABASE MANAGEMENT SYSTEMS	**2-1-0**	**3**
5.	CUTM2332	QUANTITATIVE METHODS	**2-2-2**	**6**
6.	CUTM2378	RESEARCH METHODOLOGY AND IPR	**2-0-2**	**4**
7.	CUTM2067	GEOLOGICAL REMOTE SENSING TECHNIQUE	**2-2-0**	**4**
8.	CUTM2068	MICROWAVE REMOTE SENSING AND APPLICATIONS	**2-2-0**	**4**
9.	CUTM2069	RS & GIS FOR URBAN AND REGIONAL PLANNING	**1-1-2**	**4**
10.	CUTM2070	GIS IN HEALTH	**2-2-0**	**4**
11.	CUTM1019	MACHINE LEARNING USING PYTHON	**1-2-1**	**4**
12.	CUTM2071	RS & GIS FOR HYDROLOGY AND WATER RESOURCES	**1-2-0**	**3**
13.	CUTM2072	APPLICATION OF GEO-INFORMATICS TO HAZARDS MONITORING AND MODELLING	**2-2-0**	**4**
14.	CUTM2073	GEOSPATIAL DATA INFRASTRUCTURE	**2-2-0**	**4**
15.	CUTM2074	RS & GIS FOR ENVIRONMENTAL ENGINEERING	**2-2-0**	**4**
16.	CUTM2075	RS & GIS FOR AGRICULTURE AND FORESTRY	**2-2-0**	**4**
		TOTAL CREDITS		**64**

		SKILL/DOMAIN/INTERNSHIP		
Sl. No.	**Code**	**Subject Name**	**T-P-P**	**Credits**
Domain	**ASCU2020**	**Aerial Surveying and Remote Sensing Applications**		**4-10-4**
1.	CUAS2020	REMOTE SENSING & DIGITAL IMAGE PROCESSING	**2-2-0**	**4**
2.	CUAS2021	GEOSPATIAL TECHNOLOGY AND ITS APPLICATION	**2-2-0**	**4**
3.	CUAS2022	PHOTOGRAMMETRY AND ITS APPLICATION	**0-2-0**	**2**
4.	CUAS2023	LIDAR REMOTE SENSING AND ITS APPLICATIONS	**0-2-0**	**2**
5.	CUAS2024	HYPER-SPECTRAL REMOTE SENSING AND ITS APPLICATION	**0-2-0**	**2**
6.	CUAS2025	PROJECT (Domain)	**0-0-4**	**4**
7.		SKILL	**4-0-0**	**4**

Sl. No.	**Code**	**Subject Name**	**T-P-P**	**Credits**
1.	CUTM2077	INTERNSHIP	**0-0-10**	**10**
			TOTAL	**10**
			Total Credit: 64+18+4+10	**96**

SURVEYING TECHNIQUES

Code	Course Title	Credit	T-P-PJ
CUTM2369	Surveying Techniques	3	1-2-0

Objective:

➢ Apply the knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve well-defined surveying problems appropriate to the discipline. To study the temporary adjustment of survey instruments by standard methods.

➢ Technical Adeptness - Graduates will be technically adept in Surveying Technology as well as supporting math and science disciplines, allowing these graduates to assist professional land surveyors in various surveying and mapping projects. Their technical skills and knowledge will enable them to perform their work duties with a commitment to quality, timeliness, and continuous improvement.

➢ To do various field works with the help of Modern Instruments e.g. GNSS, Total station and GPR.

➢ To Carry out topographic survey.

Learning outcome:

➢ Understand the basic principles of surveying for vertical, horizontal, linear and angular measurements to arrive at solutions to basic surveying problems.

➢ Understanding of surveying and using it in field of construction. Further draw contours to represent 3D data on plane figures.

➢ Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments.

➢ Design and implement different types of curves for deviating type of alignments, and applying surveying techniques to align highway and railway curves.

➢ Analyze type of survey operation required for problem solving in field to perform

Course outline:

Module-1 Introduction (2Th) HRS

Introduction to surveying: Classification and Principles of Surveying, Geodetic and Plane (Topographic) Surveying, Surveying Instruments, **Geometry of Ellipsoid:** Everest and WGS 84, Latitude and Longitude, Co-ordinate System and **Map Projection:** Polyconic Projection, Lambert Conformal Conic Projection, Universal Transverse Mercator Projection, **Map scale:** Fractional or ratio scale, Linear Scale, Graphical Scale.

Module-II (2Th+6Pr) Basic Survey Operations

Leveling: Concept and principles of levelling, Mean Sea Level, different types of levelling, their application, Source of error in Levelling (instrumental, natural, and personal) and elimination of errors.

Traversing: Traverse angle, Observation of Traverse Length, Selection of Traverse Station, Traverse Field Notes, Angle misclosure, Sources of error in traverse. Balancing angles, Computation of Azimuth or Bearing, Departure and Latitudes, Traverse adjustment, Rectangular co-ordinates.

Practices:
1. Calculation of RL using HI and Rise and fall method.
2. Traverse by Total Station.

Module-III (2Th+6Pr) Total station:

Characteristics of Total Station /Electronics Total Station instrument, Function performed by Total Station, Parts of Total Station instrument, Handling and Setting up a Total station, Horizontal angle measurement, Vertical angle measurement, distance and angle measurement, Remote Elevation Measurement (REM), coordinate measurement, to view the data/ points collected, area calculation, data download. Source of error in total station.

Applications of total station: Detail survey i.e., data collection., Height measurement (Remote elevation measurement- REM, fixing of missing pillars (or) Setting out (or) Stake out, Resection. etc. Remote distance measurement (RDM) or Missing line measurement (MLM).

Practices:

4. Distance, angle and slope Measurements

5. Traverse adjustment (With help of software)

6. Area calculation using Total station

7. Height measurement (Remote elevation measurement- REM).

8. Fixing of missing pillars (or) Setting out (or) Stake out.

9. Preparation of contour maps using total station and surfer software.

Module IV: Global Positioning System (2Th+6Pra) Hrs.

Introduction of Global Navigation Satellite System (GNSS): GNSS Satellites: Galileo, NAVSTAR Global Positioning System (GPS), GLONASS and BeiDou Navigation Satellite System. Indian Regional Navigation System, Navigation with Indian Constellation (NivIK), Segments of GNSS/GPS: Control Segment, Space Segments, User Segment-operations of GPS; GPS signals and data; Geo-Positioning-Basic Concepts., accuracy, error sources and analysis, methodology for collection of data, adjustment computations and analysis.

Module V: Differential Global Positioning System (2Th+4Pra) Hrs.

Differential Global Positioning System: Method DGPS/DGNSS, Static and Rapid Static, Kinematic-Real time kinematic Survey, DGPS-GPS data processing and Accuracy, Real Time Kinematic Survey; data down loading and processing. Application of GPS in Surveying and Mapping, Navigation, Military, Location Based Services, Vehicle tracking, etc. Limitation of GPS & DGPS.

Module VI - Ground Penetrating Radar(2Th+4Pra) Hrs.

GPR Explain working principle of ground penetrating radar (GPR), Describe the type of antennas used with GPR for different type of underground material detection, Use ground penetrating radar until a predefined depth from sub-surface based on the conductivity of material. Explain use of sketch/single line diagram (SLD). Describe the use of GPS/DGP in sync with GPR to get all data

populated on map. Describe the use of other Utility locator like electromagnetic locator and other utility locators.

Module VII - Cadastral Survey (2Th+4Pra) Hrs.

Cadastral map preparation methodology, unique identification number of parcel, position of existing control points and its types, Adjacent boundaries and features, Topology Creation and verification. Scale of Cadastral map, Cadastral Survey by Total Station.

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar& V S Kulkarni.
2. Elementary Surveying, by Charles D. Ghilani and Paul R. Wolf Pearson Publication

E Books:
1. Source of reference; NSQF
Online Source: NPTEL Videos (www.nptel.ac.in)

GEOMETRIC MODELING

Code	Course Title	Credit	T-P-PJ
CUTM1060	Geometric Modeling	3	0+3+0

Objective

- To introduce the students to basic theory and concepts of Auto Cad, Revit and the classical methods for the analysis of building drawings.
- On completion of this course the students will be able to know the process of making sketches, dimensions, 3D Modeling and rendering.

Learning outcome

- Demonstrate use of CAD in Civil Construction, basic knowledge of operating software & commands, and benefit of civil developments in the construction industry. Do 2d &3d drafting /design with AUTO CAD software.
- Architectural modeling set up units & element properties, annotating, detailing,

Course content

MODULE 1 - 2D SKETCHES AND DIMENSIONING (4hrs)

1. Study for Drafting and Modeling – Coordinate systems (absolute, relative, polar). (1 Hr)
2. Drawing of a Section for a duplex building. (1 Hr)
3. Drawing of an elevation for a duplex building with dimensions. (2 Hrs)

MODULE 2 - 3D SKETCHES AND PROJECTION OF DUPLEX (3hrs)

4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning. (1 Hr)
5. Drawing front view, top view and side view of objects and projection of duplex building (2 Hrs)

MODULE 3 – BUILDING PLAN AND TRUSS (4hrs)

6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.) (2 Hrs)
7. Drawing of a simple steel truss. (1 Hr)
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc, (1 Hr)

MODULE 4 – INTRODUCTION OF REVIT ARCHITECTURE (3hrs)

9. Installing Autodesk Revit architecture and understanding the user interface. (1 Hr)
10. Creation of plan for a project by using level and sketching elements. (2 Hrs)

MODULE 5 - 3D MODELING WITH RIVET (7hrs)

11. Drawing isometric projection of simple objects. (1 Hr)
12. Creation of 3-D models of simple objects and obtaining 2-D multiview drawings from 3-D model. (2 Hrs)
13. Creation of 3d syphon, 3d canal fall, 3d water tank, 3d of trusts & 3d of foot over bridge. (2 Hrs)
14. Assembly drawing & attribute text - Annotation, block & w-block & leader. (2 Hrs)

MODULE 6 – WORKING WITH PROJECT AND WORK PLANES (04hrs)

15. Working with basic building components, site design and massing studies. (2 Hrs)
16. Setting color for wall, about sectioning libraries, basic knowledge of building. (2 Hrs)

MODULE 7 – ANNOTATION AND DETAILING AND RENDERING (04 hrs)

17. Creating text notes, grids, and levels. (1 Hr)
18. Working with label and detailing. (1 Hr)
19. Understanding the rendering workflow, using lights, and creating a lighting fixture. (1 Hr)
20. Displaying a light source in a view, controlling the position of a spotlight in a building model & adding plants and entourage. (2 Hr)

Text Books:

1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing",Prentice Hall of India Ltd, New Delhi, 1993.
2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi,1993.
3. Sikka V. B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons, 1998.
4. George Omura, "Mastering in AUTOCAD 2002", BPB Publications, 2002.

Reference Books:

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Built.
2. Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 1989.
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008.
4. A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 200.

GEOSPATIAL DATA ANALYSIS IN PYTHON

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUTM 2076	GEOSPATIAL DATA ANALYSIS IN PYTHON	2-3-1	NIL

Objective

- To understand the programming features of Python
- To learn the elements of python programming
- To learn python libraries
- To learn data visualisation using python

Learning outcome

- To read data using Python Functions
- To perform data visualisation using Python Libraries
- To learn problem solving using python

Course contents

Module-I(4HrsTh+6Hrs Pra)

Introduction to Python: Features, History, applications etc., Installation of anaconda cloud and Integrated Development Environment (IDE) window/Linux Operation system: Spyder, Jupiter Note Book, Pycharm, Eclipse etc.

Spyder IDE: Introduction Spyder, setting working Directory, Creating and saving a python script file, File execution, clearing console, removing variables from environment, clearing environment, Commenting script files etc.

Python Variables, Data Type, Keywords, Operators: Arithmetic and logical. Python Data Structure: Lists, Tuples, Dictionary, Sets.

Numpy: Array, Matrix and different operations, Linear algebra and analysis, Pandas data frame: Read & write Reading files (excel, CSV and txt etc.) data cleaning and analysis, Data elections & preprocessing, Data Visualization using matplotlib and seaborn library: Line plot, Scatter plot, Histogram, Bar plot, Box plot etc.

Module-II(4HrsTh+4Hrs Pra)

Pandas data frame: Read & write Reading files (excel, CSV and txt etc.) data cleaning and analysis, Data elections & preprocessing, Data Visualization using matplotlib and seaborne library: Line plot, Scatter plot, Histogram, Bar plot, Box plot etc., Geocoding.

Module III(4HrsTh+4Hrs Pra)

Introduction to Geopandas, Fiona, shapely and GDAL and Rasterio, PyGRASS and ArcPy. Data Structure, Geometric Object: Point, Line and polygon, Attribute and methods and Geo-data Frame ArcPy. Reading and Writing Files Geo-spatial Data, subset based on location, attribute and geometry. Indexing and extracting spatial feature using multi-criteria.

Module IV(4HrsTh+4Hrs Pra)

Geometric Manipulation, subset Operation: Union, Intersection, difference, Identity, overlay etc. Aggregation, Dissolve, Append, Merging of spatial feature data, Geospatial Feature Extraction, Vector, Shapefile, Join Operation, Open Street Map Integration, Spatial Databases, Spatial Clustering.

Module V(4HrsTh+4Hrs Pra)

Spatial Interpolation Techniques: Kernel Density Estimation (KDE), IDW Interpolation, TIN Interpolation, Spatial and Temporal Statistics from Raster Data. Spatial auto correction.

Module VI(4HrsTh+4Hrs Pra)

Making Map and plot: Choropleth Analysis and Mapping, Population density map, create legend, color manipulation and marginal annotations, Cloud GIS, Multi-Client Visualization.

Text Books

1. Programming Python: Powerful Object Oriented Programming; Mark Lutz; Shroff/O'Reilly; 2010.

2. Beginning Python: Using Python 2.6 & Python 3.1; James Payne; Wiley India; 2011.

DATABASE MANAGEMENT SYSTEMS

Code	Course Title	Credit	T-P-PJ
CUTM1059	Database Management Systems	3	2-1-0

Objective

- To understand the different issues involved in the design and implementation of a database system.

- To study the physical and logical database designs, database Modeling, relational, hierarchical, and network models.

- To understand and use data manipulation language to query, update, and manage a database.

- To develop an understanding of essential Peoperties of DBMS concepts such as: database security, integrity, concurrency.

- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Learning outcome

- Describe the fundamental elements of relational database management systems

- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL

- Design ER-models to represent simple database application scenarios

- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data

- Improve the database design by normalization

- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

Course content

Module-1: **DBMS Concepts [5 Hrs]**

Data Abstraction - Data models and data independence. Instances and Schemas. Components of a DBMS and overall structure of a DBMS- Life Cycle of a DBMS application- Database terminology.

Module-2: Data Modeling [5Hrs]

Basic concepts- Types of data models- Conceptual, physical and logical database models- E-R data model and Object-oriented data model. Components of ER Model- ER Modeling symbols. Entity and entity sets- Relations and relationship sets- E-R Diagrams- Reducing E-R Diagrams into tables.

Practice

Assume we have the following application that models soccer teams, the games they play, and the players in each team. In the design, we want to capture the following:

• We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
• Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
• Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.
• For each match we need to keep track of the following:
• The date on which the game is played
• The final result of the match
• The players participated in the match. For each player, how many goals he scored,

whether or not he took yellow card, and whether or not he took red card.

• During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.

• Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design (use the back of the page if needed). Make sure cardinalities and primary keys are clear.

Module-3: Relational DBMS Model [5 Hrs]

Basic concepts, Attributes and domains- Intention and extensions of a relation- concept of integrity and referential constraints- Relational Query Languages (Relational algebra and relational calculus (Tuple and domain relational calculus).

Module-4: Relational Database Design [6 Hrs]

Notion of normalized relations- Normalization using Functional Dependency- First Normal form- Second Normal Form- Third Normal form- BCNF.

Practice

Perform NF on the given table

Module-5: SQL [6 Hrs]

Structure of a SQL query- DDL and DML, TCL- SQL queries and sub queries- Tables, views and indexes.

Practice

To study DDL-create and DML-insert commands.

(i) Create tables according to the following definition.

CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE);

CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18));

CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME VARCHAR2(18), AMOUNT NUMBER (8,2));

(ii) Insert the data as shown below.

DEPOSIT, BRANCH, CUSTOMERS, BORROW

 (1) Describe deposit, branch.

(2) Describe borrow, customers.

(3) List all data from table DEPOSIT.

(4) List all data from table BORROW.

(5) List all data from table CUSTOMERS.

(6) List all data from table BRANCH.

(7) Give account no and amount of depositors.

(8) Give name of depositors having amount greater than 4000.

(9) Give name of customers who opened account after date '1-12-96'.

Module-6: Aggregate functions [4 Hrs]

Set Operations, predicates and joins, Set Membership- Tuple variables- Set comparison- Database modifications using SQL.

Practice

Create the below given table and insert the data accordingly.

Create Table Job (job_id, job_title, min_sal, max_sal)

COLUMN NAME DATA TYPE

job_id Varchar2(15)

job_title Varchar2(30)

min_sal Number(7,2)

max_sal Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)

COLUMN NAME DATA TYPE

emp_no Number(3)

emp_name Varchar2(30)

emp_sal Number(8,2)

emp_comm Number(6,1)

dept_no Number(3)

Create table deposit(a_no,cname,bname,amount,a_date).

COLUMN NAME DATA TYPE

a_no Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Number(7,2)

a_date Date

Create table borrow(loanno,cname,bname,amount).

COLUMN NAME DATA TYPE

loanno Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Varchar2(7,2)

Insert following values in the table Employee.

emp_n emp_name emp_sal emp_comm dept _no

101 Smith 800 20

102 Snehal 1600 300 25

103 Adama 1100 0 20

104 Aman 3000 15

105 Anita 5000 50,000 10

106 Sneha 2450 24,500 10

107 Anamika 2975 30

Insert following values in the table job.

Insert following values in the table deposit.

Perform following queries

(1) Retrieve all data from employee, jobs and deposit.

(2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.

(3) Display all jobs with minimum salary is greater than 4000.

(4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.

(5) Display employee no,name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

(1) Display all employee whose name start with 'A' and third character is ' 'a'.

(2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.

(3) Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.

(4) Display the null values of employee and also employee name's third character should be 'a'.

(5) What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

(1) List total deposit from deposit.

(2) List total loan from karolbagh branch

(3) Give maximum loan from branch vrce.

(4) Count total number of customers

(5) Count total number of customer's cities.

(6) Create table supplier from employee with all the columns.

(7) Create table sup1 from employee with first two columns.

(8) Create table sup2 from employee with no data

(9) Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.

(10) Delete all the rows from sup1.

(11) Delete the detail of supplier whose sup_no is 103.

(12) Rename the table sup2.

(13) Destroy table sup1 with all the data.

(14) Update the value dept_no to 10 where second character of emp. name is 'm'.

(15) Update the value of employee name whose employee number is 103.

To study Single-row functions.

(1) Write a query to display the current date. Label the column Date

(2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary

(3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase

(4) Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.

(5) Write a query that produces the following for each employee:

earns monthly

(6) Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday.

(7) Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM.

(8) Write a query to calculate the annual compensation of all employees (sal+comm.).

Displaying data from Multiple Tables (join)

(1) Give details of customers ANIL.

(2) Give name of customer who are borrowers and depositors and having living city nagpur

(3) Give city as their city name of customers having same living branch.

(4) Write a query to display the last name, department number, and department name for all employees.

(5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output

(6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.

(7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.

(8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

Module-7: Transaction Management [8 Hrs]

Subqueries, Manipulating Data, Transaction management and Concurrency control

Practice

To apply the concept of Aggregating Data using Group functions.

(1) List total deposit of customer having account date after 1-jan-96.

(2) List total deposit of customers living in city Nagpur.

(3) List maximum deposit of customers living in bombay.

(4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.

(5) Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.

(6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998

(7) Find the average salaries for each department without displaying the respective department numbers.

(8) Write a query to display the total salary being paid to each job title, within each department.

(9) Find the average salaries > 2000 for each department without displaying the respective department numbers.

(10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.

(11) List the branches having sum of deposit more than 5000 and located in city bombay.

To solve queries using the concept of sub query.

(1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT

(2) Give name of customers who are depositors having same branch city of mr. sunil.

(3) Give deposit details and loan details of customer in same city where pramod is living.

(4) Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary.

(5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000

(6) Display the last name and salary of every employee who reports to ford.

(7) Display the department number, name, and job for every employee in the Accounting department.

(8) List the name of branch having highest number of depositors.

(9) Give the name of cities where in which the maximum numbers of branches are located.

(10) Give name of customers living in same city where maximum depositors are located.

Manipulating Data

(1) Give 10% interest to all depositors.

(2) Give 10% interest to all depositors having branch vrce

(3) Give 10% interest to all depositors living in Nagpur and having branch city bombay.

(4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844'current department number.

(5) Transfer 10 Rs from account of anil to sunil if both are having same branch.

(6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.

(7) Delete depositors of branches having number of customers between 1 to 3.

(8) Delete deposit of vijay.

(9) Delete borrower of branches having average loan less than 1000.

To apply the concept of security and privileges.

To study Transaction control commands

TEXT BOOKS

Database Management Systems: Raghu Ramakrishnan

ORACLE PL/SQL Programming – Scott Urman BPB Publications.

REFERENCES

Database Systems Concepts – Henry F Korth, Abraham Silberschatz.

Database Management Systems – Alexis Leon, Mathews Leon – Leon, Vikas Publications

QUANTITATIVE METHODS

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2332	QUANTITATIVE METHODS	6	2-2-2	NIL

2. Objective

- To acquaint the students with different application of quantitative techniques in business decision making.

3. Learning outcome

Understand statistical inference in relation to international business decision-making
Convey the results of quantitative analysis

4. Evaluation Systems

Internal & External Examination of Theory Component	Component	% of Marks	Method of Assessment
	Internal Test-1	15%	Online examination
	Internal Test-2	15%	Report and Presentation
	Attendance and Assignment	10%	Report
	End Sem. Test	60%	Written examination
Internal & External Examination of Practice & Project components	Internal Practice and Project	50%	Report and Viva
	External Practice and Project	50%	Viva-Voice
		100%	

5. Course Outline

Unit: I - Overview of Statistics (4Hrs Th + 2 Hrs Pra + 2 Hrs Proj)

Nature, Scope and limitations of statistics; uses of statistics to business and industrial activities, Statistical Data –primary and secondary data, Collection of data, Classification and tabulation of data, Diagrammatic and graphic representation of data.

Unit-II- Measurement of Central Tendency & Dispersion (4 Hrs Th + 3Hrs Pra + 3 Hrs Proj)
Data Measure of Central Tendency: Introduction, Meaning of quantitative technique, Measures of central tendency (Averages), Arithmetic mean,
Median, Mode.

Unit-III- Measurement of Central Tendency & Dispersion (4 Hrs Th + 3Hrs Pra + 3 Hrs Proj)
Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation.

Unit: IV- Discrete Random Variable and its Distribution: (4 Hrs Th + 3Hrs Pra + 3 Hrs Proj)
Discrete random variables, Expectation of discrete random variables, Variance and Standard Deviation of discrete random variables, Binomial distribution, Poisson distribution.

Unit: V- Continuous Random Variable and its Distribution: (4 Hrs Th + 3Hrs Pra + 3 Hrs Proj)
Continuous random variables, Expectation of continuous random variables, Variance and Standard Deviation of continuous random variables, Normal Distribution

Unit- VI- Regression and Correlation Analysis: (4 Hrs Th + 3Hrs Pra + 3 Hrs Proj)
Regression and Correlation Analysis: Coefficient of Correlation, Co-variance independent random variables, linear regression of two variables.

Unit- VII- Sampling and Hypothesis Test: (6 Hrs Th + 2Hrs Pra + 2 Hrs Proj)
Sampling: Introduction, sampling methods, Sampling distribution, standard error, typeI and II error, Estimation, properties of good estimator, Confidence limit. Hypothesis: Basics of hypothesis testing, Errors in hypothesis testing, Hypothesis test (one population mean), Null hypothesis, Alternating hypothesis.

Text Book

1. Gupta .S.C and Kapoor .V.K, *"Fundamentals of Mathematical Statistics"*, Sultan Chand and sons, Reprint 2003.
2. Gupta .S.C, and Kapoor, V.K, "*Fundamentals of Applied Statistics"*, Sultan Chand and sons, 2003.
3. Veerarajan.T, "*Probability Statistics and Random Processes"*, TMH, First reprint, 2004.
4. J. K. Sharma "Business Statistics", Pearson Education India, ISBN: 8177586548, 9788177586541

Reference Books:

1. Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia, 2006.

2. Sheldon Ross, Introduction to Probability Models, 9th Ed., Academic Press, Indian Reprint, 2007.

RESEARCH METHODOLOGY AND IPR

Code	Subject Name	Type of course	T-P-Pr (Credit)
CUTM2378	**Research Methodology and IPR**	Theory + Project	**(2-0-2)**

Objective

- To develop an appropriate framework for research studies
- To develop an understanding of various research designs and techniques.
- To identify various sources of information for literature review and data collection.
- To develop an understanding of the ethical dimensions of conducting applied research.
- To Demonstrate enhanced Scientific writing skills
- warn the common mistakes in the field of research methodology.
- To make expertise in academic writing, patenting

Learning outcome

- Search, select and critically analyse research articles and papers
- Formulate and evaluate research questions
- Develop the ability to apply the methods while working on a research project work

- Describe the appropriate statistical methods required for a particular research design
- Choose the appropriate research design and develop appropriate research hypothesis for a research project

Module 1: Elementary Research Methodology

Research Concept, Objective, characteristics, Steps and Significance of Research, Arbitrary and Scientific Research, Research approaches. Types of research: Historical, Descriptive, Analytical, Case Study, Quantitative vs. qualitative, Conceptual, Empirical Action Research, Research Methods vs Methodology. Research Problems: Selection and definition of the research problems, formulating a research problem, identifying variables and Constructing hypothesis; Choosing a mentor, lab and research question; maintaining a lab notebook; Selection of problems - stages in the execution of research

Module II: Academic Writing and Presentation

Technical writing skills - types of reports; layout of a formal report; standard of Journal (Impact Factor, Citation Index), Scientific writing skills - importance of communicating science; problems while writing a scientific document; plagiarism, software for plagiarism; scientific publication writing: elements of a scientific paper including abstract, introduction, materials & methods, results, discussion, references; drafting titles and framing abstracts; publishing scientific papers - peer review process and problems, recent developments such as open access and non-blind review; characteristics of effective technical communication; scientific presentations; ethical issues; scientific misconduct.

Module III: Scientific communication skills

Concept of effective communication- setting clear goals for communication; determining outcomes and results; barriers to effective communication; non-verbal communication- importance of body language, power of effective listening; Presentation skills - formal presentation skills; preparing and presenting using over-head projector, PowerPoint; defending interrogation; scientific poster preparation & presentation; participating in group discussions; Computing skills for scientific research - web browsing for information search.

Module IV: Introduction to IPR

Introduction to intellectual property; types of IP: patents, trademarks, copyright & related rights, industrial design, traditional knowledge, geographical indications, protection of new GMOs; IP as a factor in R&D; IPs of relevance to biotechnology and few case studies; plant variety protection and farmers rights.

Module V: Types of Patents

Basics of patents: types of patents; Indian Patent Act 1970; recent amendments; WIPO Treaties; Budapest Treaty; Patent Cooperation Treaty (PCT) and implications; filing of a patent application; role of a Country Patent Office; precautions before patenting-disclosure/non-disclosure - patent application- forms and guidelines including those of National Bio-diversity Authority (NBA) and other regulatory bodies, fee structure, time frames; types of patent applications: provisional and complete specifications.

PROJECTS

1. Write a review article and submit to a journal
2. Write a book chapter/ book for publishing
3. Write an original article for a journal

Books:

1. Geoffrey Marczyk, David DeMatteo, David Festinger (2005) Essentials of Research Design and Methodology, John Wiley & Sons, Inc.

2. Carol Ellison (2010) *McGraw-Hill's ConcisevGuide to WritingvResearch Papers*, McGraw-Hill

3. Kothari CR (2016) *Research Methodology: Methods and Techniques*, New Age Pvt Ltd

4. Ganbawale RM, (2017) *Bioststistics and Research Methodology*, New Central Book Agency

5. Sinha, S.C. and Dhiman, A.K., (2002). *Research Methodology*, Ess Ess Publications. 2 volumes.

6. Trochim, W.M.K., (2005). *Research Methods: the concise knowledge base*, Atomic Dog Publishing. 270p.

7. Wadehra, B.L. (2000). *Law relating to patents, trademarks, copyright designs and geographical indications*. Universal Law Publishing.

8. Neuman, W.L. (2008). *Social research methods: Qualitative and quantitative approaches,* Pearson Education

GEOLOGICAL REMOTE SENSING TECHNIQUES

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2067	GEOLOGICAL REMOTE SENSING TECHNIQUES	4	2-2-0	NIL

2. Objective

To study the spectral characteristics of Rocks and Minerals.
To study the remote sensing for geological structures mapping
To study the remote sensing for Lithological mapping
To understand geological survey techniques and GIS integration

3. Learning outcome

To study the role of remote sensing and GIS Tools in Earth Sciences.

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

Module – I:
SPECTRAL PROPERTIES OF ROCKS AND MINERALS (4HrsTh+4Hrs Pra)

Reflectance Properties of Rocks, minerals in visible, NIR, MIR, SWIR, TIR and Microwave regions Laboratory spectroscopy - laboratory and field spectral data comparative studies, Spectral reflection curves for important Rocks, Minerals.

Module – II: GEOLOGICAL STRUCTURE AND APPLICATIONS (4HrsTh+4Hrs Pra)

Significance of Geological structures, Role of aerial photographs, Photo interpretation characters of photographs and satellite images, structural mapping, Fold, fault, Lineaments, Direction circular features. Intrusive rocks, rock exposure, Fractures and Joints, Rose diagram. Digital image processing for structural mapping.

Module – III: LITHOLOGICAL MAPPING (4HrsTh+4Hrs Pra)

Introduction on Igneous rocks, sedimentary rocks, metamorphic rocks, mapping of regional scale lithological units, Image Characters of igneous rocks, sedimentary and metamorphic rocks, examples. Digital image processing of various rock types, resolution and Scale of lithological mapping and advantages.

Model – IV: GEOMORPHOLOGICAL MAPPING(4HrsTh+4Hrs Pra)

Significance of landform, Geomorphological guide, interpretation and image/photo characters, Tectonic landforms, Fluvial landforms, Denudation landforms, Volcanic landforms- Aeolian landforms, Coastal landforms. Importance of ground truth and geological field data collection.

Model–V:
GEOLOGICAL SURVEY TECHNIQUES AND DATA INTEGRATION(4HrsTh+4Hrs Pra)

Geophysical survey, surface investigation, subsurface investigation, Gravity survey, Seismic survey, refraction methods, reflection methods, applications, Magnetic survey and Electrical resistivity survey, self-potential methods, potential drop methods, resistivity values, data interpretation, Curve fitting, GIS data generation , integration and analysis.

6. TEXT BOOK
1. John J. Qu , Wei Gao, MenasKafatos , Robert E. Murphy, Vincent V. Salomonson, "*Earth Science Satellite Remote Sensing*", Springer 2007.

2. Gupta .R.P, "*Remote sensing Geology*", Springer, 2003.
3. Jean-yvesscanvk, "*Aerospatial Remote Sensing in Geology*", A.A. Balakarma, Netherlands, 1997.
4. Drury .S.A, "*Image interpretation in Geology*", Chapman and Hall, London. 1993.
5. Pandey .S.N, "*Principles and Applications of Photogeology*", Wiley eastern. 1987.

MICROWAVE REMOTE SENSING AND APPLICATIONS

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM 2068	MICROWAVE REMOTE SENSING AND APPLICATIONS	4	2-2-0	NIL

2. Objective

1. To study basics of Microwave Remote Sensing
2. To Understand parameters of radiometry and Antenna functions
3. To understand RADAR principles
4. To learn Microwave data processing
5. To study Microwave remote sensing Applications

3. Learning outcome

To study the RS & GIS data for microwave and Remote Sensing.

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice

Total		100	

5. Course outline

Module – I: BASICS OF MICROWAVE REMOTE SENSING (4HrsTh+4Hrs Pra)

Fundamentals – EMR-Electromagnetic Spectrum - Microwave Band Designation Microwave interaction with atmospheric constituents, Earth's surface, vegetation, and ocean.

Module – II: RADIOMETRY & ANTENNA SYSTEMS(4HrsTh+4Hrs Pra)
Basics - Theory of Radiometry - Sensors applications in atmosphere, ocean and land. Antenna – Types and Functions of different types of antenna.

Module – III: RADAR(4HrsTh+4Hrs Pra)

Radar-Real and synthetic aperture radars, - Principles - different platforms and sensors, System parameters, Target parameters, Radar equation measurement and discrimination, Airborne Data products and selection procedure - SEASAT, SIRA, SIRB, ERS , JERS, RADARSAT missions.

Model – IV:RADAR DATA PROCESSING(4HrsTh+4Hrs Pra)

Radar grammetry, Image processing, SAR Interferometry – Polarimetry- Interpretation of microwave data - Physical mechanism and empirical models for scattering and emission, volume scattering.

Model – V: APPLICATIONS OF MICROWAVE REMOTE SENSING(4HrsTh+4Hrs Pra)
Geological interpretation of RADAR –sites-default-files, Application in Agriculture -forestry, Hydrology - ice studies – land use mapping and ocean related studies.

6. TEXT BOOK

1. Charles Elachi and Jakob Van 2y, "*Introduction to the Physics and Techniques of Remote Sensing*", Wiley Interscience, A John Wiley and sons Inc., 2006.
2. Robert M. Haralick and Simmonett, "*Image Processing for Remote Sensing*", 1983
3. Robert N. Colwell, "*Manual of Remote Sensing Volume 1*", Americal Society of Photo - grammetry 1983.

4. Travett .J. W, "*Imaging Radar for Resources Surveys",* Chapman and Hall, London 1986.

5. Ulaby .F.T, Moore .R.K, Fung .A.K, "*Microwave Remote Sensing; active and passive"*, Vol. 1, 2 and 3, Addison – Wesley publication company 2001

RS & GIS FOR URBAN AND REGIONAL PLANNING

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2069	RS & GIS FOR URBAN AND REGIONAL PLANNING	4	1-2-1	NIL

2. Objective

1. To study the RS & GIS data
2. To study the Mapping for Urban and Regional areas
3. To study GIS Tool in Urban Planning

3. Learning outcome

1. The students will learn different tools using urban planning.
2. The students will handle different case study using image processing and GIS tools

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

Module – I: REQUIREMENTS FOR URBAN & REGIONAL PLANNING (4HrsTh+4Hrs Pra)

Relevance of remotely sensed data for Urban & Regional Analysis and Planning - Identification of settlement features from aerospace images - Visual and digital analysis techniques - Scale and Resolution concepts - Scope and limitations.

Module – II: URBAN & REGIONAL MAPPING (4HrsTh+4Hrs Pra)

Regional Mapping - City Mapping - Intra - city Mapping-Methodology - Base map preparation - Delineation of area - Change Detection and mapping - classification - Urban fringe - CBD - Urban sprawl - Case studies.

Module – III: SUSTAINABLE DEVELOPMENT PLANS (4HrsTh+4Hrs Pra)

Regional plan - Master plan - Detailed Development plan - Objective and contents - Delineation of planning area - Methodology - Integrated plans - Case studies.

Model – IV: URBAN STUDIES (4HrsTh+4Hrs Pra)

Urban growth analysis - Slum development - House typology - Site selection for urban development - Density analysis - Population estimation - Transportation network analysis - Case studies.

Model – V: GIS IN URBAN MODELLING(4HrsTh+4Hrs Pra)

GIS - Data Input - Storage - Retrieval - Suitability of GIS software for urban analysis - Modelling with GIS - Decision support systems for urban studies.

6. TEXT BOOK

1. Brench .M.C, "*City Planning & Aerial Information*", Harvard University, Cambridge, 1971.
2. Margaret Roberts, "*An Introduction to Town Planning Techniques*", Hutchinson, London 1980.
3. Gautam N.C, "*Urban land use Interpretation through Arial Photograph Interpretation*", NRSA.
4. *"IRS RS Applications to Urban Planning and Development",* Institute of Remote Sensing.

GIS IN HEALTH

1. Nomenclature

Code	Subject Name	Type of course	Credit	T-P-P	Prerequisite
CUTM2070	GIS IN HEALTH	T+P	4	2-2-0	NIL

2. Objective

The course is on geospatial analysis methods in health and to the kinds of problems for which these methods are appropriate.

The course is appropriate as an elective for those who may have no background in human sciences but who have fair knowledge in RS and GIS and interested in questions of the health of populations in geographic context.

3. Learning outcome

At the end of the course the student will be able to understand

Techniques used for disease ecology mapping and disease mapping

The usefulness of GIS for location allocation of health resources

The tools for development of Health GIS systems

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

UNIT I: MAPPING DISEASE ECOLOGY (4HrsTh+4Hrs Pra)

Disease types and causes – environmental and social factors – genetic and chronic aspects – gender and occupational bias – time and space factors in disease distribution – life cycle, statistical curves and modelling – hazards, disasters, accidents and health. Health Care and Delivery Systems: Health Care Systems and Delivery in India; Medical Services and Facilities, Health Information and Planning; Issues and Prospects – Ecosystem Approach, The issue, The Approaches, Lessons and Successes – Future Directions.

UNIT II: GEOSPATIAL DATA FRAMEWORK (4HrsTh+4Hrs Pra)

Disease records and geo-referencing – birth, movements and permanency – individuals, families and communities – problems of address coding and digitization – the privacy of records – risk and vulnerability – short term and long term trends – resurgence – historical records and reliability.

UNIT III: DISEASE MAPPING (4HrsTh+4Hrs Pra)

Spatial patterns of disease – mapping causal factors – endemic and epidemic zonation – tests for spatial clustering and fragmentation – applications of RS and GIS in disease mapping – deterministic stochastic and uncertainty models -vulnerability and comforts.

UNIT IV: HEALTH ANALYSIS (4HrsTh+4Hrs Pra)

GIS for Analysis of Health. Choosing and applying analytical methods for mapping, modeling and analyzing health and disease, including point pattern analysis, surface analysis, overlay analysis, network analysis, and cluster and regression analysis.

Case studies of Odisha State.

UNIT V: HEALTH AND WEB-GIS (4HrsTh+4Hrs Pra)

Sharing disease data and web" ontology requirements and applications – open source service environments – methods of XML aid OGC services" web map context, services and processing (WMS. WMC and VVPS)" web service quality and SDI.

TEXT BOOKS:

Phillips, D.R. Health and Health Care in the Third World, Longmans Scientific. London, 1990

Levine, A.J Viruses, Scientific American, New York, 1992.

Ellen K. Cromley, Sara L. McLafferty 2011 , GIS and Public Health, Second Edition, Guilford Press, ISBN 9781609187507 – CAT# Y124676, 2nd Edition.

Massimo Craglia (Editor), Ravi Maheswaran (Editor) (2004) GIS in Public Health Practice, CRC Press, 1st Edition

REFERENCES:

1. Ravi Maheswaran and Massimo Craglia, GIS in Public Health Practice, Boca Raton, CRC Press, 2004.

2. Lai C, Ann S.H Mak. "GIS for Health and the environment: Development in Asia Pacific Region, Berlin, 2000.

3. Anthony C Gatrell "GIS and Health, Markku Loytonen, European Science Foundation, 1998.

4. Cromley, E.K. & McLafferty, S.L. (2012) GIS and Public health. 2nd Edition. Guilford Press. New York. pp 503. ISBN 978-1-60918-750-7. Available from the vendor of your choice or from Amazon.com - GIS and Public Health(link is external).

MACHINE LEARNING USING PYTHON

Course Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Learning outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

<div align="center">**Course content**</div>

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.
- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .

- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .

- Mathematical formulation of K-Means Clustering.

- Defining K value and its importance in K-Means Clustering.

- Finding appropriate K value using elbow technique for a particular problem.

- Implementation of K-Means clustering for IRIS datasets Projects

- To be defined based on respective study area of student.

Text Book:
1. EthemAlpaydin, Introduction to Machine Learning, Second Edition,

    http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012.

    Web Resource:
1. https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51

RS & GIS FOR HYDROLOGY AND WATER RESOURCES

1. Nomenclature

Code	Subject Name	Type of course	Credit	T-P-P	Prerequisite
CUTM2071	RS & GIS FOR HYDROLOGY AND WATER RESOURCES	T+P	3	1-2-0	NIL

2. Objective

To study the basic knowledge of hydrologic data To study the watershed characters and applications To study the hydrological disaster and role of remote sensing & GIS To study the ground water resources mapping by remote sensing & GIS To study the surface water resources mapping by remote sensing & GIS

3. Learning outcome

To study and understand application of RS and GIS techniques for hydrology and water resources.

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

Module – I: HYDROLOGICAL COMPONENETS (4HrsTh+4Hrs Pra)

Hydrological cycle, Estimation of various components of hydrological cycle, rainfall, runoff, evaporation, transpiration, evapotranspiration, crop evapotranspiration, depression and interception loss, infiltration and percolation losses.

Module – II: WATERSHED CHARECTERS (4HrsTh+4Hrs Pra)

Watershed, types, divide, catchment, command area, stream types, influent, effluent, ephemeral, non-perennial. Drainage network, different pattern, morphometric analysis, linear, area, relief aspects. GIS applications for watershed analysis.

Module – III: HYDROLOGICAL STIDIES (4HrsTh+4Hrs Pra)

Hydrological aspects- mapping and monitoring, management mapping of snow covered area and glacial outburst, soil moisture estimation, Optical and microwave remote sensing techniques, drought zonations, Agricultural, meteorological and hydrological, flood mapping pre and post flood area estimation and control measures –GIS applications for hydrological disaster studies

Model – IV: GROUNDWATER RESOURCES APPLICATIONS(4HrsTh+4Hrs Pra)

Types of Aquifers formations confined and unconfined aquifers Assessment of Groundwater potential zones and Groundwater mapping. Site selection for recharge structures- Hydrogeological Mapping GIS applications to ground water studies

Model – V: SURFACE WATER RESOURCES APPLICATIONS (4HrsTh+4Hrs Pra)
Surface water bodies, lakes, reservoirs, ponds, rivers, channels, mapping- change detection, Water harvesting structures, in-situ and Ex-situ, Mapping and monitoring of catchment and command area, Water logging and salt affected area mapping, Reservoir Sedimentation, sedimentation control. GIS applications to surface water studies

6. TEXT BOOK
1. Raghunath .H.M, "*Hydrology – Principles – Analysis – Design",* New Age International Publishers, New Delhi. 2006 .
2. Ramasamy .S.M, "*Remote sensing in water resources",* Rawat publications, New Delhi ,2005.
3. Murty.V.V.N, "*Land and Water Management Engineering"*, Kalyani Publishers, New Delhi – 2002.
4. Agarwal C.S and Garg.P.K, "*Text Book on Remote Sensing in Natural Resources, Monitoring and Management",* Wheeler publishing Co & Ltd., New Delhi, 2010.

APPLICATION OF GEO-INFORMATICS TO HAZARDS MONITORING AND MODELLING

1. Nomenclature

Subject Name	Code	Credit	T-P-P	Prerequisite
CUTM2072	Application of Geo-informatics to Hazards Monitoring and Modelling	4	2-2-0	NIL

2. Objective

To study the basic knowledge of Hazards
To study the about natural and environmental hazards
To study the damage estimation after hazards.

3. Learning outcome

To study and understand the applications of RS and GIS techniques for Natural, Environmental and Coastal hazards.

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

Module I : Overview of Hazards (4HrsTh+4Hrs Pra)

Introduction to natural hazards, impact and mitigation in Global and Indian context. An overview of geological hazards with special emphasis on causes and consequences. An overview of flood hazards and climate change issues. An overview of drought hazards and climate change issues. An overview of *Environmental hazards* and land degradation with special emphasis on extents, cause and consequences. An overview of *coastal hazards*. An overview of snow avalanche, GLOF and glacier related hazards and their assessment using geospatial inputs. An overview of urban and associated hazards.

Module II: Geological Hazards Modelling and Analysis (4HrsTh+4Hrs Pra)

Fundamental of landslide hazard assessment, Landslide hazard zonation and vulnerability analysis using spatial modelling technique. Early warning system and disaster preparedness, Flood inundation depth, vulnerability and risk assessment, Generation of Geospatial database for flood hazards for analysis & assessment.

Module III : Drought Monitoring and Desertification(4HrsTh+4Hrs Pra)

Concepts and definition of drought and importance of drought assessment, Fundamentals of agro-meteorology. Meteorological drought indicates, Remote sensing for droughts monitoring and assessment. Definition and processes for climate change impact assessment on droughts and desertification.

Practice:

1. Computation of meteorological drought and drought indices.
2. Vegetation condition Index for drought monitoring.
3. Mapping decertification lands/indicates.

Module IV : Forest fire and damage assessment (4HrsTh+4Hrs Pra)

Forest fire monitoring and active fire retrieval using LEO and geostationary satellite data. Forest fire risk modelling and fire spread modelling. Forest damage and assessment.

Practice:

1. Forest fire risk assessment.
2. Object based image analysis for forest fire damage.

Module V: Costal hazard mapping and Modelling (4HrsTh+4Hrs Pra)

Mapping monitoring and modelling of costal vulnerability / hazards (salt water intrusion and oil spill). Modelling cyclones and prediction (tracking, landfall determination, and inundation) and impact assessment (damage and loss estimation) and mitigation issues. Monitoring and modelling of tsunami.

Practice:

1. Shoreline Change Analysis
2. Coastal Vulnerability Index analysis
3. Monitoring and modelling of Tsunami.

Module VI: Extreme event analysis and air pollution studies (4HrsTh+4Hrs Pra)

Rainfall estimation / perdition and extreme event analysis. Study of haze and dust storm. Modelling of atmospheric pollution and impact on human health. Fog detection and monitoring using satellite data.

Module VII: Urban vulnerability, risk modelling and industrial hazards (4HrsTh+4Hrs Pra)

Seismic risk assessment in urban areas and building codes for earthquake resistant designs. Urban flood hazard and vulnerability modelling. Geospatial modelling for urban pollution is dispersion and modelling. Urban micro and heat islands: role of EO data.

Practice:

1. Urban seismic risk assessment.

2. Urban flood hazard and vulnerability modelling.

3. Urban micro climate heat island: role of EO data.

Referred Books

1. Barrett, E.C. & Brown (1991). Remote Sensing for Hazard Monitoring and Disater Assessment: Marine and Costal Applications In The Mediterranean Region. Philadelphia: Gordon and Breach Scence Punlishers.

2. Burrough, P.A. (1976). Principles of Geographic Information System for Land Assessment,. Oxford: Clarandon Press.

3. Cutter, S., Boruff, L., Bryan, J., & Shirley, W.L. (2003). Social Vulnerability to Environmental Hazards", Social Science Quarterly, 84 (2), 242-261.

4. Kogan., F. N. (2000). Contribution of Remote Sensing to Drought Early Warning. NOAA, NESDIS.

5. Komecny, G. (2003). Geoformation: Remote Sensing, Photogrammetry and GIS. New Delhi: Taylor and Francis.

GEOSPATIAL DATA INFRASTRUCTURE

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2073	Geospatial Data Infrastructure	4	2-2-0	NIL

2.Objective

Discuss the applicability and accessibility of spatial data at all levels
Understand the fundamentals about GeoSDI and its role in decision making
Describe critically the factors that influence the development of a GeoSDI
Practice data retrieval from GeoSDIs and combine it in a GIS environment

3. Learning outcome

Identify GeoSDI requirements and stakeholders

Understand the GeoSDI architecture that enables the availability of data at distinct levels

Use and manage web services, namely metadata catalogues and map services

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

Module I: GIS & Geo-visualization (4HrsTh+4Hrs Pra)

Introduction to GIS and Geo-visualization, Models and structures - Advanced models and structures (3D, temporal), Data acquisition (GPS, RS, field surveying), Precision and quality of data, Reference systems and transformations, Spatial Databases, Spatial analysis and modelling of phenomena, Geo-visualization (cartography).

Module II: GeoSDI (4HrsTh+4Hrs Pra)

Introduction to GeoSDI, Definition, GeoSDI components, GeoSDI hierarchy (local, regional, national, trans-national), GeoSDI applications, Environmental protection, Risk management, Organizational dimension of GeoSDI, Laws, policies, institutions, people, Standards, specifications

and metadata for spatial data, Public data, CRS, units, JRC, INSPIRE, etc. Public participation, VGI, Spatial data issues in the region of Australia, NewZealand and India.

MODULE III: Data for GeoSDI (4HrsTh+4Hrs Pra)

Data feeding for GeoSDI for environmental management, Connection to global geographical data websites, Cost free data, Satellite imagery, Meteorological data, Elevation data, Land use data, Population data, Road data, Using metadata to assess data quality, Centralizing real time data, Most common systems based on sensors with real time data collection, Hardware fundamentals, Meteorological sensors networks, Tide gauges, Participatory and mobile crowdsource data, Sensor types and capabilities, Applications and Problems of crowdsource data.

Model IV: GEOSDI Business Analysis (4HrsTh+4Hrs Pra)

Web Services, Web Services, Web services standards / protocols, Geoportals, geo-visualization, dashboards, Web service composition, service oriented architectures, Client examples, Business Analysis Benefits, Global and national environmental strategies and legal frameworks Required data for activities subject to legal environmental constraints, Economical evaluation, Costs of the infrastructure Costs of operation, Possible strategies to generate income, Business models, Types of contracts, Citizens as data suppliers, Project management concepts (AGILE).

Model V: Sustainable Development, Future Direction for SDI Development
(4HrsTh+4Hrs Pra)

The Effect on Government, The Role for SDIs, The Case for E-Governance, Covering the SDI Landscape, SDI Development Issue.

6. TEXT BOOK

1. SDI Cook Book, 2012
2. Developing Spatial Data Infrastructures From Concept to Reality Edited ByIan
   P. Williamson, Abbas Rajabifard, Mary-Ellen F. Feeney, 2018

RS & GIS FOR ENVIRONMENTAL ENGINEERING

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2074	RS & GIS FOR ENVIRONMENTAL ENGINEERING	4	2-2-0	NIL

2.Objective

To study the basic Environmental aspects and satellites.
To study the RS & GIS application in soil degradation.
To study the RS & GIS application in water pollution.
To study the RS & GIS application in Air quality.
To understand the RS & GIS application in Environmental management.

3. Learning outcome

The outcome of this subject is to know how to prepare different environmental hazards map air pollution map water pollution map etc.

To prepare different modelling using software's.

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

UNIT I - BASICS (9 hours)

Water- Air-Land-Marine Environment Global Climatologic, urban Environment Environmental satellites GEOS, NOAA, AVHRR, CZCR Monitoring land, water, atmosphere and ocean using Remote Sensing Data. Water- Air-Land-Marine Environment Global Climatologic, urban Environment:

UNIT II - SOIL DEGRADATION   (9 hours)

Spectral characteristics of soil- Soil formation- classification of soils- soil survey interpretation and mapping- impact of agricultural and industrial activity on soil properties. RS & GIS in assessing Soil salinity- alkalinity- water logging studies- soil erosion- types and estimation -control measures.

UNIT III - WATER QUALITY AND GROUND WATER POLLUTION   (9 hours)

Spectral characteristics of water- classification of water quality -Data base creation and quality modeling using GIS. Aquifer Vulnerability -Intrinsic and specific vulnerability- contaminant transport model.

UNIT IV - AIR QUALITY AND COASTAL STUDIES   (9 hours)

Atmosphere: Chemicals, Particulate matters present in the atmosphere, allowable limits, Remote Sensing techniques - Monitoring atmosphere constituents- air pollution- industrial activity, modeling using GIS - Ecology studies- Coastal color monitoring- marine studies

UNIT V - ENVIRONMENTAL MANAGEMENT   (9 hours)

Revenue management-environment and ecological concerns- Resource development in remote areas-Impacts of anthropogenic activity- Solid Waste management- Forest classification Mapping – Biomass estimation - Carbon footprints and sinks, carbon trading, carbon credits and marketing, Indian and international status.

REFERENCES
1. Lilliesand .T.M and Kiefer .R.W, "Remote Sensing and Image Interpretation", John Wily and sons, 1994.
2. Burrough .P.A and McDonnell .R.A, "Principles of Geograj1JhicaJ Information Systems", Oxford University Press, 1988.

3. Lintz .J and Simonet, "Remote Sensing of Environment", Addison Wesley Publishing Company, 1994.

RS & GIS FOR AGRICULTURE AND FORESTRY

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2075	**RS & GIS FOR AGRICULTURE AND FORESTRY**	4	2-2-0	NIL

2.Objective

To study the Spectral characteristics of Vegetation
To study the integrated analysis of GIS in agriculture and forest development

3. Learning outcome

The outcome of this subject is to know how to prepare Biomass estimation, forest fire map etc.
To prepare different modelling using software's.

4. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Seminar	10	Report and Presentation
	Internal Practice	20	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

5. Course outline

UNIT I - SPECTRAL CHARACTERISTICS OF LEAF   **(9 hours)**

Structure of leaf - Spectral behavior of leaf – Vegetation indices – NDVI, TVI, SVI, PCA – Vegetation classification and mapping - Estimation of Leaf area index, Biomass estimation – Estimation of terrestrial carbon assimilation in forests - case studies.

UNIT II - FOREST MAPPING   (9 hours)

Forest type and density mapping and forest stock mapping using RS technique - factors for degradation of forests – deforestation/afforestation/. Change detection in forests - case studies

UNIT III - BIODIVERSITY CHARACTERIZATION MAPPING   (9 hours)

Forestry – Forest taxonomy – Linnaeus classification - Biodiversity characterization – Forest fire risk zonation – wildlife habitats suitability analysis - case studies.

UNIT IV - AGRICULTURAL APPLICATIONS   (9 hours)

Identification of crops -acreage estimation -production forecasting - pests and disease attacks through remote sensing -crop stress detection due to flood and drought - catchments and command area monitoring.

UNIT V - SOIL APPLICATIONS   (9 hours)

Soil survey and land use classification - water logging - characters of saline, alkali soils - soil erosion – types – Estimation of soil loss from USLE using Remote sensing and GIS - Wasteland development.

REFERENCES

1. Steven .M.D and clark .J.A, "Applications of Remote Sensing in Agriculture", Butterworths, London 1990.

2. Remote Sensing Applications Group", Space Applications Centre, Crop Average and production Estimation (CAPE): An Anthology from January 1986 - June 1996. (Publications in Journals, Seminars I Symposium proceedings), Ahmedabad, August 1996.

3. Negi .S.S," A Handbook of forestry. International Book distributors", Dehradun, 1986. Space Applications Centre, Manual of procedure for Forest mapping and Damage Detection using satellite data, Ahmedabad, 1990.

DOMAIN

Aerial Surveying and Remote Sensing Applications

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerial Surveying and Remote Sensing Applications	ASCU2020	Theory + Practice + Project	4 - 10 - 4	Nil

Courses Division:

1. **Remote Sensing & Digital Image Processing**   (2-2-0) 45Hours
2. **Geospatial Technology and its Application**   (2-2-0)45Hours
3. **Photogrammetry and its Application**   (0-2-0) 25Hours
4. **Lidar Remote sensing and its Applications**   (0-2-0) 25Hours
5. **Hyper-spectral Remote Sensing and its Application**   (0-2-0) 25Hours
6. **Project**   (0-0-4) 54Hours

Objective:

- Apply the principles of Remote Sensing and GIS to collect, map and retrieve spatial information.
- Plan, assess and evaluate natural and manmade systems using geospatial models and methods.
- Use geospatial tools and techniques for natural resources planning and management.

Learning outcome:

- Identify specific data and methodologies for effective mapping and evaluation of natural resources.
- Develop geospatial models and tools to address the social and engineering problems
- Design multi-criteria geospatial systems for decision-making process
- Work in a team using geospatial tools and environment to achieve project objectives.
- Pursue lifelong learning for professional advancement

Evaluation System: As per university norms

Remote Sensing and Digital Image Processing

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Remote Sensing and Digital Image Processing	CUAS2020	T+P	4	2-2-0	NIL

Module: I Basic Concept of Remote Sensing (4+6) Hours

Introduction of Remote Sensing: Principles of RS and its Type; Energy sources and Radiation principles, Pixel, DN value, Energy equation; EMR and Spectrum; EMR interaction with Atmosphere; scattering, Absorption, Atmospheric window, Black body radiation; EMR interaction with earth surface features, reflection, absorption, emission and transmission, Spectral signature; Interaction with vegetation, soil, water bodies; Advantage of RS over conventional method, Limitation, Ideal remote sensing.

Practice:

1. Installation of Image Processing software's
2. Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc.
3. Layer stacking
4. LUT and Image Subset
5. Spectral Signature mapping (soil, vegetation, water)

Module: II Digital Image (2+3) Hours

Data acquisition: Procedure, Reflectance and Digital numbers; Intensity, Reference data, Ground truth, Analog to digital conversion, FCCs, TCC, Platforms and sensors; orbits ,types, Resolutions; Image Interpretation; visual- Interpretation keys.

Practice:

1. FCCs and TCC
2. Resolution
3. Image Interpretation

Module: III Satellite Information and Principles (2+3) Hours

Land observation satellites, characters and applications; PSLV, GSLV, Satellite, Platform Types; LANDSAT series; IRS series; IKONOS Series; QUICKBIRD series; Weather/Meteorological satellites; INSAT series, NOAA, Applications, Marine observation satellites; OCEANSAT

Practice:

1. Image filtering and Band ratioing
2. Mosaicking

Module: IV Image Acquisition and Format (2+4) Hours

Digital Image Processing; Export and import, Data formats; BSQ, BIL, BIP, Run length encoding, Image Compression Data products.

Practice:

1. Export and Import
2. Histogram
3. Subset using AOI

Module: V Image Processing (3+4) Hours

IMAGE RECTIFICATION; Pre-processing and Post processing Geometric distortion; sources and causes for distortion, rectification, GCP, Resampling, Image registration; Radiometric distortion; sources and causes, atmospheric correction.

Practice: (Spectral Python and ENVI)

1. Geometric correction
2. Radiometric correction
3. Atmospheric correction

Module: VI Image Classification (4+4) Hours

IMAGE CLASSIFICATION; Classification techniques, types, Supervised and Un-supervised; Principal Component Analysis (PCA); Image Enhancement; Accuracy assessment.

Practice:

1. PCA analysis (spectral Python and ENVI)
2. NDVI, DVI, NDWI calculation
3. Image classification in Spectral angel Mapper
4. MNF Ratoing
5. Supervised Classification(spectral Python and ENVI)
6. Un-supervised Classification(spectral Python and ENVI)
7. Image Enhancement(ENVI)
8. Accuracy Assessment(ENVI)

Module: VI Remote Sensing and Its application (3+4) Hours

Microwave RS and its application; Thermal RS and its application; Optical RS and its application; Sensor and its types.

Practice: Using Spectral Python

1. Application of microwave remote sensing (Structural Trend line mapping)
2. Application of thermal remote sensing and case study(Land surface Temp.estimation)
3. Application of optical remote sensing and case study

Geospatial Technology and its Application

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Geospatial Technology and its Application	CUAS2021	T+P	4	2-2-0	NIL

Module I: GIS & Cartography (2+4) Hours

Components of GIS, Types of Data in GIS, Scale Application of GIS, Advantage and limitation of GIS. History and development of Cartography; Definition, scope and concepts of cartography, Characteristics of Map; Categories of maps, Methods of mapping, relief maps, thematic maps.

Practice:

1. Symbology (generalization, symbology, and colour effect, change symbology and use transparency in creative ways) using GRASS and QGIS

Geo-referencing (Map to Image and Image to Image), Projection, Data base creation: Digitization using Point, line and polygon, Edit, Clip, Intersect, Union, Merge, Join and subset. Attribute table editing

2. Google Earth (Convert Shape file to KML Format and KML File to shape file, Import data into Google earth, Bhuvan view, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, overlaying an image into Google earth)

Module: II Data analysis tools(2+4) Hours

Raster data spatial analysis, Network analysis, Vector operations and analysis, Data editing, Primary and secondary data. Data model and data structure, Geodatabase and metadata, GIS data model, Overlay analysis, Network modeling, Data Structure Models, Spatial interpolation; measurement and analysis methods, Advantage and disadvantage.

Practice:

1. Linking of spatial and Non-spatial data and queries, Joining tabular data with the feature attribute data, Non-spatial query, Spatial query, Spatial join, Vector based spatial analysis, Raster based spatial data analysis
2. Buffering and Creation of Contour
3. Network Analysis

Module: III Multi-criteria analysis and decision making (3+4) Hours

Principles and elements of multiple-criteria decision making, Classification of Multiple-criteria Decision Problem: Multi-objective Vs Multi-attribute, Decision Alternatives and constraints, Criterion weighting, Decision rules, Multiple-criteria decision making in spatial data analysis.

Introduction to AHP, Basic Principles of AHP, Effect Table, Pair Wise comparison, Consistency, Weightage, performance score, Case studies involving AHP

Practice:

1. Mapping accident locations using Linear Referencing technique.
2. Preparation of raster layers for Multicriteria Analysis
3. Solving a spatial problem using Multicriteria Analysis (Spatial AHP)

Module: IV Digital Elevation Model (DEM) (2+4) Hours

Concept of DEM, Various techniques to generate DEM, Importance of spatial resolution to DEM, Integration of DEM to satellite data, Common derivatives of DEM, Slope, Aspects, TIN, Sources of DEM, Laminations and future of DEM.

Practice:

1. Google earth to DEM, 3D Map preparation, Contour to DEM, TIN and Aspect
2. DEM based surface Hydrology modeling,
3. LiDAR classification, DEM from LiDAR

Module: V Geospatial Technology for Water resources Engineering (3+4) Hours

Watershed, types, divide catchment, command area, stream types, Drainage network, different pattern; morphometric analysis, Bifurcation ratio analysis; Assessment of **Groundwater potential zones** and Groundwater mapping; Site selection for recharge structures, Hydrogeological Mapping GIS applications to ground water studies.

Practice:

1. Mapping of catchment, command area
2. Drainage network analysis
3. Morphometric analysis
4. Mapping of Groundwater potential zones

Module: VI Geospatial Technology for Environmental Engineering (3+4) Hours

Monitoring atmosphere constituents; air pollution, industrial activity, modeling using GIS, Resource development in remote areas, Impacts of anthropogenic activity, Solid Waste management; Water Pollution, Shortest path Identification, Network analysis.

Practice:

1. Air pollution mapping
2. Solid waste management
3. Water pollution

Photogrammetry and Application

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Photogrammetry and Application	CUAS2022	T+P	2	0-2-0 25Hours	NIL

Practice Experiments:

3.1 Scale determination from aerial photo

3.2 Aerial photo Interpretation

3.3 Use of Parallax bar and determination of Height from   stereo pair

3.4 Satellite DEM and ortho Image generation

3.5 Primary and additive colour creation

3.6 Stereo test

3.7 Mosaic

3.8 Stereoscopic vision

3.9 Relief displacement

3.10 Analog to digital conversion, Orientation of stereo model and Determination of Height

3.11 Aerial mapping using DRONE

3.12 Mosaicking of aerial Photo

3.13 Correction and rectification

3.14 DTM generation Image correction ,Link between GIS and Digital Photogrammetry and Ortho Image generation

LIDAR Remote Sensing and Application

Subject Name	Code	Credit	T-P-P	Prerequisite
LIDAR Remote Sensing and Application	CUAS2023	2	0-2-0 25Hours	NIL

Practice Experiments:

4.1 Download of LIDAR data

4.2 Layer stacking

4.3 Data Validation

4.4 Georeferencing Technology

4.5 Boresight Calibration - Lidar Data Pre-processing

4.6 Project Coverage Verification - Review Lidar Data against Field Control

4.7 Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget.

4.8 Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering

4.9 Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement

4.10 Breaklines, Contours, and Accuracy Assessment

4.11 Topographic Mapping, flood inundation analysis, line-of-sight analysis

4.12 Forestry, various types of LIDAR sensors-, vegetation metric calculations - specific application software.

4.13 Corridor mapping system, data processing and quality control procedures.

4.14 Modelling

Hyperspectral Remote Sensing and Application

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Hyperspectral Remote Sensing and Application	CUAS2024	T+P	2	0-2-0 25Hours	NIL

Practice Experiments:

5.1 Introduction to ENVI, Python and Downloading, Displaying, and Analyzing Hyperspectral Imagery

5.2 Atmospheric Correction of Hyperspectral Imagery.

5.3 MNF ratioing from Hyperspectral(EO1)

5.4 Hyperspectral Image Classification Using Spectral Angle Mapper (SAM) & Spectral Feature Fitting (SFF).

5.5 Hyperspectral Imagery Classification Using an Unsupervised Neuron fuzzy System.

5.6 Application of Hyperspectral Imagery in Geological Studies.

5.7 Hyperspectral Signatures & Feature Fitting.

5.8 Hyperspectral Remote Sensing for Agriculture and soil Studies.

5.9 Hyperspectral Remote Sensing for Forestry Applications.

5.10 Hyperspectral Remote Sensing for Urban Studies.

5.11 Mineral identification from Hyperspectral imagery

5.12 Python Programming for Hyperspectral data analysis.

Project

Subject Name	Code	Credit	T-P-P	Prerequisite
Project	CUAS2025	4	0-0-4	NIL

List of Projects :

1. Flood inundation mapping and Risk Evaluation using Geospatial Technology.

2. Landslide Hazard mapping using GIS and RS.

3. Land use and Land cover Dynamics using Earth observation Technology.

4. Mangrove change detection study using Multi-Temporal satellite data.

5. Solid waste management and shortest path identification using GIS Technology.

6. Watershed management using GIS Technology.

7. Identification Mineral mapping using GIS and RS.

8. Crop Health Monitoring using Geospatial Technology.

9. Identification of Hydrocarbon Locales using space inputs and Geospatial Technology.

10. Ground water exploration using GIS and RS Techniques.

11. Interlinking of River using GIS Technology.

12. Biomass estimation using Space Technology.

13. Land surface Temperature mapping using RS Technology.

14. Climate Change study using Earth Observation Technology.

15. Erosion and Accretion study of Shorelines and its impact in coastal habitats.

Students take up group projects and deal the following activities during the project. The project Report should contain below gate process.

Step 1: Functional Planning of the project and Objective Identification

Step 2: Literature Review

Step 3: Preparation of Flow chart for Methodology

Step 4: Layer creation and GIS analysis

Step 5: Identifying the possible Risks involved (specific to the project)

Step 6: Report writing

INTERNSHIP

1. Nomenclature

Code	Subject Name	Credit	T-P-P	Prerequisite
CUTM2077	INTERNSHIP	10	0-0-10	NIL

2. Objective

The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings, which will facilitate development of a new/improved product, process for the benefit of the society.

3. Learning outcome

1. To undertake research in an area related to the program.
2. Publication is mandatory in peer review journal

5. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Review 1	10	
	Review 2	15	
	Review 3	25	
	Total	50	
External Examination	Final	50	
Total		100	

6. Course outline

M.Sc. internship should be socially relevant and research oriented ones. Each student is expected to do an individual project. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

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CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

MASTER OF SCIENCE IN APPLIED AND CLINICAL MICROBIOLOGY

2020

Master of Science in Applied and Clinical Microbiology
Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1	DC-1	AECC-I	SFS-1	
SC-2	DC-2	AECC-II	SFS-2	
SC-3	DC-3		SFS-3	**TOTAL CREDITS**
SC-4	DC-4			
SC-5	DC-5			
SC-6	DC-6			
SC-7	DC-7			
SC-8	DC-8			
	DC-9			
	DC-10			
28 Credits	**50 Credits**	**6 Credits**	**12 Credits**	**96 Credits (Minimum Credits required)**

Master of Science in Applied and Clinical Microbiology

Programme Structure

SEMESTER	BASKET1	BASKET2	BASKET3	BASKET4
	School Core Courses	**Discipline Core Courses**	**Ability Enhancement Compulsory Course (AECC)** To be Selected from University Basket	**Skill Courses** (To be selected from University Basket)
I	SC-1 SC-2 SC-3 SC-4	DC-1		SFS-1
II	SC-5SC-6SC-7	DC-2DC-3DC-4	AECC-IAECC-II	SFS-2
III	SC-8	DC-5DC-6 DC-7 DC-8	AECC-III	SFS-3
IV		DC-9DC-10		
Minimum Credits required (96Credits)	**28Credits**	**50Credits**	**6Credits**	**12Credits**

BASKETI

School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1709	Analytical Techniques	3+1+0	4
SC-3	CUTM1710	Biological Chemistry	2+1+0	3
SC-4	CUTM1712	Clinical Hematology	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1714	Cell and Molecular Biology	2+0+1	3
SC-7	CUTM1718	Clinical Biochemistry	2+1+0	3
SC-8	CUTM1720	Histology	3+1+0	4

BASKETII

Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	
DC-1	CUTM1711	General Microbiology	3+1+0	4
DC-2	CUTM1713	Systematic Bacteriology	3+1+0	4
DC-3	CUTM1717	Applied Microbiology	2+1+0	3
DC-4	CUTM1716	Medical Parasitology and Mycology	3+2+0	5
DC-5	CUTM1719	Immunology and Virology	3+2+0	5
DC-6	CUTM1722	Clinical Bacteriology	3+1+0	4
DC-7	CUTM1721	Research Methodology	2+0+1	3
DC-8	CUTM1754	Mini Project	0+0+2	2
DC-9	CUTM1755	Internship		12
DC-10	CUTM1756	Project		12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

MASTER OF SCIENCE IN

MEDICAL LABORATORY TECHNOLOGY

2019

MASTER OF SCIENCE IN
MEDICAL LABORATORY TECHNOLOGY

Programme StructureTotal Credit: 96

		SEMESTER-I		
SL NO	CODE	SUBJECT	SUBJECT Type Theory+ Practice+ Project (T+P+Pj)	CREDITS
1	MSMT1101	Medical Laboratory Technology	4+0+0	4
2	MSMT1102	Anatomy and Physiology	4+0+0	4
3	MSMT1103	Haematology	4+0+0	4
4	MSMT1104	Medical Instrumentation and Technique	4+0+0	4
5	MSMT1105	Haematology Lab	0 +6+0	4
	Total			20

SEMESTER-II				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1.	FCBS0101	Environmental Science	3+0+0	3
2.	FCHU1203	Business Communication	0+3+0	2
3.	MSMT1201	Medical Microbiology	4+0+0	4
4.	MSMT1202	Molecular Biology and Clinical Biochemistry	4+0+0	4
5.	MSMT1203	Clinical Pathology	4+0+0	4
6.	MSMT1205	Blood Banking	4+0+0	4
7.	MSMT1206	Clinical Pathology Lab	0+3+0	2
8.	MSMT1207	Microbiology Lab	0+3+0	2
			Total	25
		SKILL COURSE- I		2/4

SEMESTER-III				
SL NO	SUBJECT CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1	MSMT2306	Immunology & Parasitology	4+0+0	4
2	MSMT2302	Clinical Hematology	4+0+0	4
3	MSMT2303	Biochemistry	4+0+0	4
4	MSMT2304	Histology	4+0+0	4
5	MSMT2307	Research Methodology	3+0+0	3
6	FCHU0204	Communicative Practice Laboratory–II	0+3+0	2
7	MSMT2308	Immunology Lab	0+3+0	2

8	MSMT2309	Biochemistry Lab	0+3+0	2
9	MSMT2310	Histopathology Lab	0+3+0	2
10	MSMT2311	Mini Project	0+0+3	2
			Total	**29**
		SKILL COURSE- II		2/4

SEMESTER-IV				
SL NO	**SUBJECT CODE**	**SUBJECT**	**SUBJECT TYPE (T+P+Pj)**	**CREDITS**
1.	MSMT2403	Project	-	10
2.	MSMT2404	Internship	-	12
		Total		22

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in 6 months)

Skill Courses:
Students can choose any suitable skill course offered by the University

Value Added Courses:

*Suggested courses:

SL NO	**SUBJECT CODE**	**SUBJECT**
1	FCMG0115	Human Rights
2	FCMG0401	Gender Issues in Development

4*(Or courses suggested by the respective School)

Note: Skill course & Value-added course, to be opted by the student along with the regular courses, as suggested in the syllabus.

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

MASTER OF OPTOMETRY

2021

Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	
School Core Courses	**Discipline Core Courses**	**Ability Enhancement Compulsory Course (AECC)** To be selected from University Basket	**Skill Courses** (To be selected from University Basket)	
SC-1 SC-2 SC-3	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16	AECC-1 AECC-2 AECC-3	SFS-1 SFS-2 SFS-3	**TOTAL CREDITS**
10 Credits	**68 Credits**	**6 Credits**	**12 Credits**	**96 Credits (Minimum Credits required)**

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1721	Research Methodology	2+0+1	3
SC-2	CUTM1958	Business and Clinical Aspects of Optometry	2+0+1	3
SC-3	CUTM1959	Recent Advancement in Optometry	2+0+2	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	
DC-1	CUTM1960	Applied Optometric Optics	2+2+0	4
DC-2	CUTM1961	Advanced Ophthalmic Diagnostic Procedures & Instrumentation	2+2+0	4
DC-3	CUTM1962	Epidemiology and Community Optometry	2+0+1	3
DC-4	CUTM1963	Introduction to LASER Technology	1+0+2	3
DC-5	CUTM1964	LASER in Refractive Surgery	1+0+2	3
DC-6	CUTM1965	Orthoptics and Vision Therapy	2+2+0	4
DC-7	CUTM1966	Advanced contact lens practice -I	2+2+0	4
DC-8	CUTM1967	LASER in Anterior segment disorders & Glaucoma	1+0+3	4
DC-9	CUTM1968	Paediatric Optometry and binocular Vision I	2+1+0	3
DC-10	CUTM1969	LASER in Posterior segment disorders	1+0+2	3
DC-11	CUTM1970	Paediatric Optometry and Binocular Vision II	2+1+0	3

DC-12	CUTM1971	Advance contact lens practice II	2+2+0	4
DC-13	CUTM1972	Ocular diseases & Therapeutics	2+0+1	3
DC-14	CUTM1973	Neuro Optometry	2+1+0	3
DC-15	CUTM1974	Specialty Clinic	0+10+0	10
DC-16	CUTM1975	Dissertation	0+0+12	12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the norms of the University.

M. Tech in Power System and Control

(Two years Programme)

School of Engineering & Technology

Centurion University of Technology and Management, Odisha

2022

Program Objective

Power System and Control

1. To define Automation and Control and explain the differences in the sense of power sector engineering.
2. Research oriented studies on data monitoring and acquisition for power sector.
3. To acquire adequate knowledge about the latest technology and methods used in power system and control engineering.

Eligibility Criteria
Bachelor's degree in Engineering/Technology or equivalent degree in Electrical, Electronics & Electrical, Electrical &Electronics, Electronics & Tele-Comm., Electronics & Instrumentation, Electronics & Communication with minimum 6.5(CGPA)or 60% of marks in B. Tech. or equivalent degree.

Selection Process
The selection process is through central counseling on the basis of merit in qualifying CUEE or PGAT or GATE score. GATE qualified candidates are eligible for scholarship throughAICTE.

Degree Awarded
After successful completion of degree, student will be awarded with M. Tech. in **Power System and Control** by Centurion University.

Course Structure
This is a 2-year full-time post graduate program which involves first year (Semester- I & II) of intense coursework and second year (Semester- III & IV) internship and project work.

Total Credit: 70

Department of Electrical & ElectronicsEngineering
M Tech in Power System& Control
Course Structure

First Year- 1st Semester

Sl. No.	Code	Subject	T	P	P	Credits
		Theory Courses				
1	MTPS1101	Computer Applications toPower System Analysis	3	0	0	3
2	MTPS1102	Non-Linear Control Systems	3	0	0	3
3		**Elective-1***	3	0	0	3
4	MTPS1103	Micro Controller Application with PLC	2	2	0	4
5	MTPS1104	SCADA- Compatible with all PLC	2	1	0	3
		Practice Courses				
6	MTPS1105	Advanced Electrical in Automation	0	2	0	2
7	MTPS1106	Sensors and VFDInterface to PLC and SCADA	0	2	0	2
		Total Credits				20

First Year - 2nd Semester

Sl. No.	Code	Subject	T	P	P	Credits
		Theory Courses				
1	MTPS1201	Digital Control System Applied to Power System	3	0	0	3
2	MTPS1202	Power System Dynamics & Stability	3	0	0	3
3		**Elective-2****	3	0	0	3
5	MTPS1203	SCADA-Compatible with fixed brand of PLC	2	1	0	3
6	ISRM1201	Research Methodology andIPR	2	0	0	2
		Practice Courses				
7	MTPS1204	Distributed Control System	1	1	0	2
8	MTPS1205	Power System Monitoring by HMI	1	1	0	2
		Total Credits				18

Second Year - 3ʳᵈ Semester

Sl. No.	Code	Subject	T	P	P	Credits
1	MTIP2101	Industry Internship and Project – I/Dissertation				16
		Total Credits				16

Second Year – 4ᵗʰ Semester

Sl. No.	Code	Subject	T	P	P	Credits
1	MTIP2102	Industry Internship and Project – II/Dissertation				16
		Total Credits				16

*ELECTIVE-1

Code	Subject	L	P	p	Credits
MTPS0101	High voltage Engineering	3	0	0	3
MTPS0102	Optimization Techniques in Power System	3	0	0	3
MTPS0103	Digital Power System Applications	3	0	0	3
MTPS0104	Power Quality Analysis	3	0	0	3
MTPS0105	Non-Conventional Renewable Energy	3	0	0	3

**ELECTIVE-2

Code	Subject	L	P	p	Credits
MTPS0106	Renewable Energy System Integration with Grid	3	0	0	3
MTPS0107	Concepts of Smart Grid Technology	3	0	0	3
MTPS0108	Distribution System Engineering	3	0	0	3
MTPS0109	Power System Security	3	0	0	3
MTPS0110	Digital Signal Processing Applicationsin Power System Protection	3	0	0	3

2021

COURSE BOOK

B.A. Media and Communication

Choice Based Credit System

(BA-MC - CBCS)

School of Media & Communication

Centurion University of Technology & Management

BA-MC Course CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired	Scope
I	Core Discipline	84	Core
II	Discipline Specific Elective	24	Choice
III	Generic/ Interdisciplinary Elective	24	Choice
IV	Skill Enhancement courses	06	Core
V	Ability Enhancement Courses (AECC)	10	Core
	Total Credits	148	

2021

COURSE BOOK

Master of Arts (Media and Communication)

School of Media and Communication
Centurion University of Technology& Management

MA Media Communication
2018
Course Structure

Duration of Program - 2 Years
Number of Semesters - 4
Total Credits of the Program - 100

Semester-I

Sl. No	Code	Subject	Workshop	Theory	Practical	Project	Total	Marks
1.	MAMC1101	Communication Research Methods	4	0	2	2	8	100
2.	MAMC1102	Introduction to Print & Electronic Media	3	0	3	2	8	100
3.		Elective-1	0	0	4	3	7	100
		Total					**23**	**300**

Semester-II

Sl. No	Code	Subject	Workshop	Theory	Practical	Project	Total	Marks
1.	MAMC0501	Society, Media and Communication	0	4	0	4	8	100
2.	MAMC0903	Cultural Studies	0	4	2	2	8	100
3.		Elective-2	0	0	4	3	7	100
4		SKILL	0	0	2	2	4	
							27	**300**

Semester-III

Sl. No	Code	Subject	Workshop	Theory	Practical	Project	Total	Marks
1.	MAMC1103	Advanced Digital Media	2	0	3	3	8	100
2.	MAMC1104	Digital Media Platforms	2	0	3	3	8	100
3.		Elective-3	0	0	4	3	7	100
4		SKILL	0	0	2	2	4	
							27	**300**

Semester-IV

Sl. No	Code	Subject	Credits					Marks
			Workshop	Theory	Practical	Project	Total	
1.	MAMC1105	Film studies	3	0	3	2	8	100
2.	MAMC1106	Advertising and Public Relations	3	0	3	2	8	100
3.	MAMC0301	Thesis	0	0	4	3	7	100
							23	**300**

Elective Courses

Sl. No.	Course Type	Course Code	Subject	Credits					Marks
				Workshop	Theory	Practical	Project	Total	
1.	Elective	MCDE0601	Animation	0	0	4	3	7	100
2.	Elective	MCDE0602	Radio Jockeying	0	0	4	3	7	100
3.	Elective	MCDE0603	TV Anchoring	0	0	4	3	7	100
4.	Elective	MCDE0604	Fashion Photography	0	0	4	3	7	100
5.	Elective	MCDE0605	Camera Operator	0	0	4	3	7	100
6.	Elective	MCDE0606	Video Editor	0	0	4	3	7	100
7.	Elective	MCDE0607	Web Content Development	0	0	4	3	7	100
8.	Elective	MCDE0608	Sound Engineer	0	0	4	3	7	100
9.	Elective	MCDE0609	Adobe tools and Illustrations	0	0	4	3	7	100

2021

COURSE BOOK

Master of Business Administration (MBA)

Rural and Urban Development Management

&

Agri-Business Management

School of Management

Centurion University of Technology & Management

About the Programs-

Being the fifth largest economy and the second highest populated country, the development story of India has been through many peaks and valleys. According to Forbes magazine the 15 richest Indians has a cumulative worth of USD 215 billion and at the same time 363 million remain Below Poverty Line (BPL). Quoting Mahatma Gandhi's golden words "India lives in its villages", 65 percent population live in rural villages, and 85 percent of them primarily depend on agriculture for their livelihood. Data from National Sample Survey Office (NSSO) data shows that more than one-fifth of rural households with self-employment in agriculture have income less than the poverty line, agriculture labour productivity in terms of gross value added (GVA) in India is less than a third of that in China and 1% of that in the US. Further, taking into account other socio economic indicators such as; education, health, housing, amenities and employment, the performance of rural India is abysmal. To address it, there have been several reforms being undertaken since independence by the respective elected governments in terms of policies, public institutions and investment in public infrastructure. In addition to it, several initiatives have been taken at the grass root level by many not for profit agencies as well as the corporates through their social responsibility activities. However a major obstacle lies in manging these organizations by professionals who are competent and also willing to make a career in these sectors. Keeping these challenges in mind the Master program in Rural and Urban Development Management (RUDM) was conceived.

Program Structure

The MBA in RUDM is a two year full time residential program. The objective of the programs is to create a cadre of professionals to promote sustainable and equitable socio-economic development of the people in general and that of underprivileged sections of the society in particular and empower the communities through professionally managed institutions. The focus of the program is management of development and agribusiness sectors within the spirit of justice, liberty, equality, equity, fraternity and environmental sustainability. Most of the organisations of, by and for poor are often undermanaged, mis-managed and working in cross-purpose. The professionals graduating from this program will perform a role of field action managers and through their expertise will strengthen those institutions as well as create new institutions for realising the above objective.

The Learning Approach:

The Programmes will be facilitated through a Participatory Learning & Action Approach (PLA). It is a way of learning where the participants learn through a taking a series of predefined actions followed with structured reflection on the tasks and activities thus leading to design a suitable course of action. An Illustration of the PLA is given below.
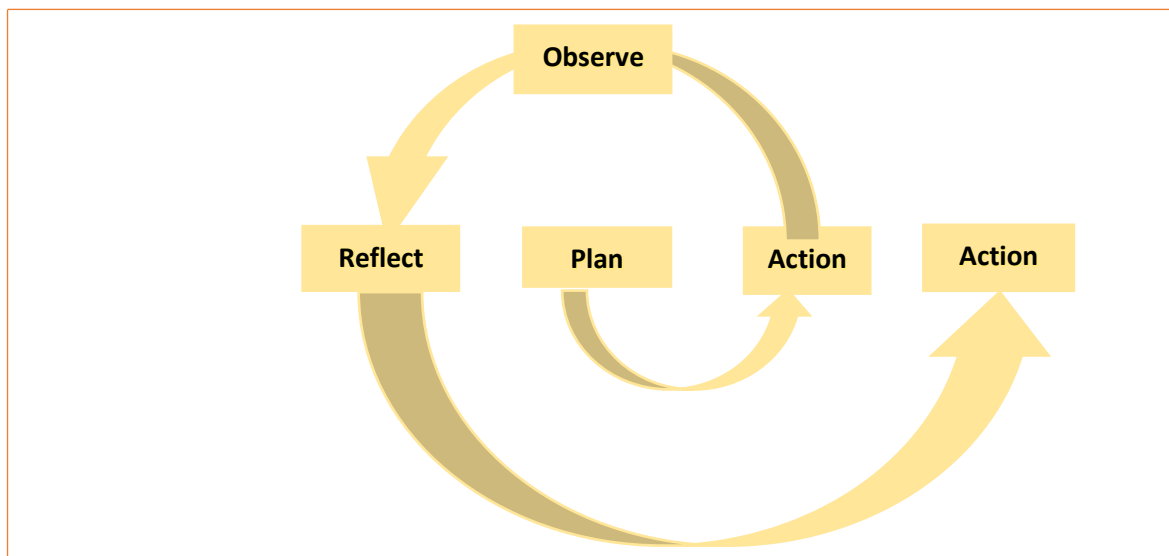
The Methods:

All the learning methods mentioned below are influenced with the principles of participatory/Experiential action learning

1. **Rural immersion** for students during this field work will be actual working with SHG's has to stay with villager's home for understand the realities of the rural areas and developing good relationship with the villagers for implementing social development projects.

2. **Field Learning** is an integral part of the programmes which will enable the participants with action-reflection-action learning and prepare them with their ability to solving problems in real life situations in the rural and urban development context. Each course will be mapped by keeping in mind the design principle of Participatory and experiential Learning where students learn by working in field.

3. **Method of teaching** will be highly creative innovative in nature. The teaching will follow an intuitive method of learning the basic paradigms. Concepts, theories, practices and facts. Besides, the classroom teaching sessions will follow a path of logical sequence of practical knowledge seeking mode. The students will engage in a variety of modes and means of seeking information and transforming them into knowledge sets. Lectures both online and classroom are typically to stimulate

discussions based on the inputs from the field or analysing a case and reflect it to the development/management concepts. Besides classroom teaching, there will be workshop, conferences, and online class on various dimensional on rural management and rural development.

4. **Development internships** with partner institutions /organizations to appreciate the real-life situation with an experienced supervisor/ mentor from the organization. The students will be engaging with the five to six SHG's to understand their needs and issues, during his filed work students will be receiving stipend for work with SHG's during field work. After completion of course students can be work with the SHG's as intern for one year to learn more about the rural realities with option to avail the jobs during the placement season.

5. **Workshops** are designed & facilitated by expert practitioners from development and rural sector to provide not only the state of art practices followed by organizations but also appraise the students with the challenges and finding ways to generate a solution.

Course Structure

First Year (Common for RUDM/ABM)

Semester-1

Sl No	Subject Code	Name of the Subject	Credit	T-P-P
01	CUTM1175	Micro Economics	4	3-0-1
02	CUTM1218	Contemporary Development Communication	4	1-1-2
03	CUTM1190	Accounting for Managers	4	3-0-1
04	CUTM1219	Data Analysis using Excel and Python	4	0-2-2
05	CUTM1178	Indian Society and Culture	2	1-0-1
06	CUTM1220	Development Project Management Planning Tools and Techniques-I	4	1-1-2
07	CUTM1221	Natural Resource Management	2	1-0-1
08	CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
09	CUTM----	Field Work	4	0-0-4
		Total Credits	**24**	

Semester-2

Sl No	Subject Code	Name of the Subject	Credit	T-P-P
01	CUTM1222	Development Theory and Practice	4	2-0-2
02	CUTM1223	Development Project Management Planning Tools and Techniques-II	4	0-2-2

03	CUTM1177	Economic Environment for Business	4	3-0-1
04	CUTM1224	Social Research Methods	4	2-1-1
05	CUTM2043	Rural Marketing	4	2-1-1
06	CUTM1225	Agricultural Marketing	4	2-0-2
07	CUTM1195	Corporate Finance	4	3-0-1
08	CUTM1015	Climate change and Sustainable Development	3	1.5-0-.5
09	CUTM1182	Job Readiness: Employability	Non Credit	
10	CUTM----	Field Action Component	4	0-0-4
		Total Credits	**33**	

Semester-3

Sl No	Subject Code	Name of the Subject	Credit	T-P-P
1		Strategic Management	4	2-0-2
2		Supply chain Management	2	0-0-2
3		Community Organization and Development	2	0-0-2
4		Food Security and Right to Food	2	0-0-2
5		Financial Inclusion and Micro Finance	2	0-0-2
6		Organization Behaviour	4	2-0-2
		Field Action Component	4	0-0-4
8		Total Credits	20	

Semester-4

Sl No	Subject Code	Name of the Subject	Credit	T-P-P
1		Human Resource Management and Organisation Development	4	2-1-1
2		Public Policy: Design, Analysis and Implementation	4	2-0-2
3		Social Entrepreneurship and CSR	2	1-0-1
5		Digital and Social Media Marketing	2	0-0-2

6		Elective-1	2	0-0-2
7		Elective-2	2	0-0-2
8		Elective 3	2	0-0-2
		Dissertation and Viva Voce	8	
		Total Credits	**26**	

List of Electives/ Workshops -

Sl No	Code	Thematic areas of the workshop	Credit	T-P-P
1		Skill Ecosystem development	2	0-0-2
3		Local Governance systems	2	0-0-2
4		Rural Haat & Market Analysis	2	0-0-2
5		Community Owned and Managed Businesses	2	0-0-2
6		Corporate Social Responsibility	2	0-0-2
7		Disaster Management	2	0-0-2
8		Management of Rural Health	2	0-0-2
9		Management of Rural Education	2	0-0-2
10		Sustainable Rural Livelihoods	2	0-0-2
11		Organizing Conference	2	0-0-2
12		Managing Watersheds	2	0-0-2
13		M&E of Development Projects	2	0-0-2
14		Poverty reduction strategies	2	0-0-2
15		Issues in Tribal Development	2	0-0-2
16		Extension strategies for development	2	0-0-2
17		Fund Raising for Social Cause	2	0-0-2

2021

COURSE BOOK

Bachelor of Business Administration

Choice Based Credit System

(BBA-CBCS)

School of Management

Centurion University of Technology& Management

HIG-5, Phase-1, BDA Duplex, Pokhariput, Bhubaneswar-751020

http://www.cutm.ac.in

Preface

The course of BBA may be viewed as an intermediate step towards in integrated master's course in management. It aims at catering to the demand for the skilled and chiselled management professional in the industry in general at all levels in the world of Indian business in particular.

The teaching and learning philosophy of the BBA program are driven by the focus on students as learners, and creating a peer-to-peer learning environment which maximizes their potential. Therefore, in every course we teach, independent of the content of the course, we strive to create environments whereby students are motivated to take part as members of this learning community. This objective is achieved through classroom participation, expository writing, creation of e-learning tools, projects, problem-based learning, and assignments, etc. All the courses are designed and evaluated for rigor in terms of difficulty level, skills acquired, and improvement in communication ability. Another unique feature of the program is the industry interface: Action Learning Project. Groups of three to four students engage with local companies to submit professional quality reports and analysis. This offers students significant first-hand exposure to the real corporate work environment.

Programme Objectives

The course of BBA may be viewed as an intermediate step towards pursuing a master's degree in management. The programme aims to satisfy the demand for skilled and well-honed management professionals in the industry in general and in the holistic world of Indian corporates in particular.

The teaching and learning philosophies of the BBA program are sharpened by an unwavering focus on students as learners and creating a peer-to-peer learning environment which provides opportunities to maximise their potential. Therefore, in every course which is taught, independent of the content of the course, the motivation is to create environments whereby students are inspired to take part as members of this learning community. This objective is achieved through class participation, expository writing, creation of e-learning tools, projects, problem-based learning, and assignments, etc. All the courses are designed and evaluated for rigor in terms of difficulty level, skills acquired, and improvement in communication ability. Another unique aspect of the program is the linkage to industry interface: *Action Learning Project*. Groups of three to four students engage with local companies to submit professional quality reports and analysis. This offers students significant first-hand exposure to the real corporate work environment.

To dissipate knowledge of general management concepts, principles and processes.

1) To dissipate knowledge of general management concepts, principles and processes.

2) To develop analytical and decision making abilities at strategic and operational level in real time business situations.

3) To develop communication skills; listen, comprehend, write and present business problems and solutions in different areas

4) To understand ethical principles and their applications in business and interpersonal contexts.

Program Outcome:

BBA Programme helps in

1. Serving as a frontline executive in Business Enterprise including manufacturing and services (FMCG, FMCD, telecom, retail, infrastructure, financial services, etc.)
2. Pursuing higher education (MBA, etc.);
3. Starting one's own business as an entrepreneur

Specific Programme Outcome

Accent and focus is on developing a well-rounded personality with an in-depth knowledge of basic management concepts in order to enable the students to exude self-confidence and cultivate requisite communication and presentation skills which are valued by the corporates in India.

BBA is the stepping stone for an aspiring student to don the robes of an entrepreneur or wear the hat of a budding first line manager whose engagement with the customers is of vital importance for the corporates. In many corporate entities the frontline person is the last mile link facilitating a customer's engagement with the top management.

Career Opportunity:

After completion of BBA, one can join as a frontline executive in Business Enterprise including manufacturing and services (FMCG, FMCD, telecom, retail, infrastructure, financial services, etc.);or pursue higher education (MBA, etc.); or start own business as an entrepreneur.

Eligibility:

10+2 (Senior Secondary) or its equivalent public examination conducted by any recognised Board of Education in India or abroad.

Programme Structure:

The three-year degree course of BBA will consist of six semesters. One academic session of one year will be devoted to two semesters. Candidates shall be admitted to BBA 1st Semester only and thereafter required to qualify all Six Semesters consequently to earn the degree. Minimum credit: 148

Scheme of Examination:

Internal Examination: 40%

University End-semester examination: 60%

BBA Course CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired	Scope
I	Core Discipline	84	Core
II	Discipline Specific Elective	24	Choice
III	Generic/ Interdisciplinary Elective	24	Choice
IV	Skill Enhancement courses	06	Core
V	Ability Enhancement Courses (AECC)	10	Core
	Total Credits	148	

2021

COURSE BOOK

Bachelor of Commerce

Choice Based Credit System

(BCOM-CBCS)

School of Management
Centurion University of Technology & Management
17 Forest Park, Bhubaneswar, Odisha, 751009

http://www.cutm.ac.in

Preface

The B.Com. Program is designed to enable the students to develop practically applicable knowledge of Baking & Accounting sector through an enhanced approach to both risk and business management. The program develops a broad array of analytical skills in business, as well as more specialized skills in these fields through the study of accounting, business economics, securities markets, commodity and currency market, mutual funds, financial planning and analysing& interpreting financial statements. Students will also receive classroom-based training, practical training and preparation for various industry certifications if they opt. Our programs address the educational needs of those seeking successful careers in institutional finance which includes careers in banking, brokerage, insurance, and other financial fields.

Programme objectives:

The objective of this course is to prepare a select cadre of future-ready professionals who will not only be efficient & effective managers but also inspirational & innovative leaders with a particular emphasis on creative & refreshing approach to business problems resolution and identifying & tapping new opportunities in the market place.

The program is designed to familiarize students with the Banking and Accounting operations and also to prepare and analyse the Financial Statements. The curriculum provides an integral part of the education for students looking for Banking & Accounting positions in SMEs as well as Corporate houses and Businesses

Programme Features:

- Job oriented curriculum
- Projects & Presentations
- Training on latest Accounting Software
- Internship
- Hands on training using Simulation Software
- Regular seminars and grooming sessions

Career Opportunity:

After the completion of the B.Com course, a student can quality for Accounts Executive, Accountant, Accounts Receivable Manager, Accounts Payable Manager, Banking Operation Executive, Financial Planner, Accounts Manager, Senior Manager – Accounts, Finance and Business Entrepreneurship etc. In addition, the student can pursue higher studies.

Eligibility for Admission:

10+2 (Senior Secondary) or its equivalent public examination conducted by any recognised Board of Education in India or abroad.

Programme Structure

This Program is of three years duration. Each year shall be divided into two semesters. First, Third & Fifth semester shall ordinarily begin in July and end in November. Second, Fourth & Sixth semester shall begin in December and end in April. **Total Credit: 148**

Scheme of Examination:
- Internal Examination: 40%
- University End-semester examination: 60%

B.Com Course Structure

Basket	Basket Category	Minimum Credits to be acquired	Scope
I	Core Discipline	84	Core
II	Discipline Specific Elective	24	Choice
III	Generic/ Interdisciplinary Elective	24	On Job Internship
IV	Skill Enhancement courses	06	Core
V	Ability Enhancement Courses (AECC)	10	Core
	Total Credits	148	

2021

COURSE BOOK

Master of Business Administration

(MBA)

School of Management

Centurion University of Technology & Management

Program Objective:

The program objective is to create management leaders who can navigate the ever-changing business landscape. The curriculum is getting updated continuously to bring in existing and emerging challenges and opportunities in the business environment, both nationally and internationally. The teaching methods are geared towards experiential learning and student centric. It is accomplished through interactive class room teaching: flipped classes, case study analyses, workshops, student projects, live industry interactions and more.

Relevant topics comprise legal aspects of marketing, ethical, social and environmental concerns in product, pricing, distribution and promotion decisions, socially responsible marketing; green marketing, cause relating marketing; social marketing, corporate governance and social responsibility of business, legal framework of business, e-business and cyber laws, labor and social security laws, ethical and legal issues in performance management, workforce diversity, role of ethics in organizational behavior, negotiation, international business; ethical and social considerations in strategic management and cross border ethics management.¬Provide students with the opportunity to develop and broaden their management and leadership skills. ¬Develop managerial knowledge and strategic agility, providing students with a broader skill set and a fresh perspective and encouraging them to seek out bold, innovative solutions for today's business and societal challenges.

Program Structure:

MBA is two years full-time program, offered in four semesters. The first year commences in July every year continuing till April in the following year. At the end of first year, namely in the second week of April, students go for 8 weeks internship. The second year starts from mid-June and continues through till March of the following year. The courses offered in the first year, divided into two semesters, are compulsory for all the students and include foundation courses and functional area courses. In the second year, which is divided into two semesters, students drive through advanced functional area courses, integrative courses and elective courses of different areas of specialization.

Program Outcome:

Masters of Business Administration program helps in

1) Building the confidence of the students by emphasizing on domain knowledge so that they can contribute responsibly in the corporate sector.
2) Creating an option of working in Business Enterprises including manufacturing and services oriented enterprises (FMCG, FMCD, telecom, retail, infrastructure, financial services, etc.).
3) Pursuing higher education for a career in teaching and research
4) Starting one's own business as an entrepreneur.

Program Specific Outcomes

MBA program also helps in honing the business acumen of the participants by providing a live laboratory of human endeavor in the field of management. The program is delivered with the avowed objective of closely acquainting the students with prevailing corporate ethos in the state of Odisha and in India in general. It also provides a clear corporate roadmap for creating a career trajectory among the students. It gives timely inputs to students who are interested in research related activities and who show an inclination to contribute to society by becoming a cog in the wheels of institutions in the academic space. Budding entrepreneurs of various hues are invited to rub shoulders with the students to inculcate the ethos of independent and creative thinking.

School of Management, CUTM has been consistently reinventing management education with the objective of creating management leaders who can navigate the ever-changing business landscape. The curriculum is constantly updated to meet the dynamic needs of industry and academia.

This provides an opportunity to continuously engage in innovating curricula by envisaging current and emerging challenges and opportunities in the business environment. To incorporate the contemporary academic and practice concepts, the curriculum design and delivery process is dynamic in nature. The Curriculum has been suitably designed to give ample opportunity for experiential learning through domain based curriculum comprising of class room input, theme based workshop, project based learning, case based teaching and exposure through live projects, industry interaction etc.

The first year commences in July every year continuing to April in the following year. In second week of April, students go for 8 weeks internship and they join back in mid-June for the second academic year which culminates in March of the following year. The courses offered in the first year, divided into two semesters, are compulsory for all the students. In the second year, divided into two semesters, all students undertake compulsory core courses and opt for specialization courses according to different areas of specialization. In addition to these, students are required to register for value added courses offered during different semesters. Value added courses are considered as sessional papers.

MBA Course Structure

<table>
<tr><th colspan="4">MBA Programme</th></tr>
<tr><th>Basket</th><th>Basket Category</th><th>Minimum Credits to be acquired</th><th>Scope</th></tr>
<tr><td>I</td><td>Foundation</td><td>30</td><td>Core</td></tr>
<tr><td>II</td><td>Digital Technologies</td><td>06</td><td>Choice</td></tr>
<tr><td>III</td><td>Management Potential Development</td><td>36</td><td>Core</td></tr>
<tr><td>IV</td><td>Sustainability</td><td>06</td><td>Core</td></tr>
<tr><td>V</td><td>Domain Courses/ Elective Courses</td><td>24</td><td>Choice</td></tr>
<tr><td>VI</td><td>Summer Internship</td><td>04</td><td>Choice</td></tr>
<tr><td></td><td>Total Credits</td><td>106</td><td></td></tr>
</table>

Note:
- Student has to acquire minimum 16 credits from any one domain areas to claim specialisation.
- Student can opt for elective or domain area courses in 2nd year.

FOUNDATION

Sl No	Code	Course	Credit	Type T+P+P*
1	CUTM1181	Evolution of Management Thought	1	0+0+1
2	CUTM1182	Job Readiness	3	0+0+3
3	CUTM1183	Quantitative Techniques	5	3+1+1
4	CUTM1184	Micro Economics	4	3+0+1
5	CUTM1185	Data analysis through Microsoft Excel	2	0+0+2
6	CUTM1186	Economic Environment of Business	4	3+0+1
7	CUTM1187	Indian Society and Culture	2	1+0+1
8	CUTM1188	Operation Research	1	0+0+1
9	CUTM1189	Principles of Management	2	1+0+1
10	CUTM1190	Basics of Design Thinking	2	0+1+1
11	CUTM1191	Data Analysis and Visualization Using Python	4	0+1+3

* T+P+P= Theory+Practice+Project

DIGITAL TECHNOLOGIES

Sl No	Code	Course	Credit	Type T+P+P
1	CUTM1192	Introduction to AI/ML	1	0.5+0+0.5
2	CUTM1193	Introduction Data Analytics	1	0.5+0+0.5
3	CUTM1194	Introduction Additive Manufacturing/3D Printing	1	0.5+0+0.5
4	CUTM1195	Introduction to AR/VR	1	0.5+0+0.5
5	CUTM1196	Introduction to Emerging Mobility Solutions	1	0.5+0+0.5
6	CUTM1197	Introduction to Blockchain	1	0.5+0+0.5
7	CUTM1198	Introduction to Robotics	1	0.5+0+0.5

MANAGEMENT POTENTIAL DEVELOPMENT

Sl No	Code	Course	Credit	Type (T+P+P)
1	CUTM1199	Accounting for Managers	4	3+0+1
2	CUTM1200	Marketing Management	4	3+0+1
3	CUTM1201	Organizational Behaviour and Structure	4	3+0+1
4	CUTM1202	Talent Acquisition and Development	4	2+0+2
5	CUTM1203	Marketing Research	4	2+0+2
6	CUTM1204	Corporate Finance	4	3+0+1
7	CUTM1205	Production & Operations Management	3	2+1+0
8	CUTM1013	Project Management	3	2+0+1
9	CUTM1206	Introduction to PLM (Platforms such as 3DS)	2	1+1+0
10	CUTM1207	Designing User/Customer Experience (UX/CX)	2	1+0+1
11	CUTM1208	Supply Chain Management	2	1+0+1

SUSTAINABILITY

Sl No	Code	Course	Credit	Type (T+P+P)
1	CUTM1014	Gender, Human Rights and Ethics	3	1.5+0+1.5
2	CUTM1015	Climate Change, Sustainability and Organisation	3	1.5+0+1.5

Sl No	Code	Course	Credit	Type (T+P+P)
Financial Management Elective				
1	CUFM2350	Advanced Managerial Accounting	4	3+0+1
2	CUFM2351	Financial Institutions, Markets & Services	4	3+0+1
3	CUFM2352	Commercial Banking and ALM	4	3+0+1
4	CUFM2353	Security Analysis And Portfolio Management	4	1+0+3
5	CUFM2354	Project Appraisal & Financing	4	2+1+1
6	CUFM2355	Current Asset Management	4	2+1+1
7	CUFM2356	Financial Analysis and Visualization	4	1+0+3
8	CUFM2357	Robotics Process Automation (RPA) in Finance	4	2+0+2
Marketing Management Elective				
1	CUMM2360	Rural Marketing	4	2+1+1
2	CUMM2361	Sales and Distribution Management	6	2+2+2
3	CUMM2362	Services & Financial Services Marketing	4	2+1+1
4	CUMM2363	Brand Management & Consumer Behaviour	4	2+2+0
5	CUMM2364	Digital Marketing & Marketing Communications	4	2+0+2
6	CUMM2365	Retail &Etail Management	4	2+0+2
7	CUMM2366	B2B Marketing	4	2+2+0
Human Resource Management Elective				
1	MGHR2317	Performance Management	4	2+0+2
2	MGHR2318	Organization Change and Development	4	2+0+2
3	MGHR2319	Human Resource Planning and Sourcing	4	2+0+2
4	MGHR2320	Training and Development	4	2+0+2
University-wide Domains				
1	DACU2200	Data Analytics- Visualisation	20	0+14+6
2	BACU2210	Business Analytics	18	0+12+6
3	MLCU2000	Data Science and Machine Learning	26	2+9+15
4	ARCU2060	Gaming and Immersive Learning (AR & VR)	20	5+5+10
5	GMCU2140	GO-TO-MARKET(3D Experience)	22	4+10+8
6	FPCU2310	Food Processing	29	3+15+11
7	ABCU2320	Agri Business Management	23	2+0+21
8	FSCU2330	Commodity and Food Storage	29	3+15+11