University of Engineering and Management
Institute of Engineering & Management,SaltLake Campus
Institute of Engineering &Management,NewTown Campus
University of Engineering & Management,Jaipur

3rd Semester Syllabus for MCA AdmissionBatch 2023

Index:

Syllabus Structure:

THEORY							
SL. NO.	**SUBJECT CODE**	**SUBJECT NAME**	**CONTACTS (PERIODS / WEEK)**				**CREDITS**
			L	**T**	**P**	**TOTAL**	
1	MCA301	Operating Systems and Systems Software	3	1	0	4	4
2	MCA304	Software Engineering & TQM	3	1	0	4	4
3	MCA306	Data Science & Data Analytics	3	1	0	4	4
4	MCA307	Statistics and Numerical Techniques	3	1	0	4	3
5	MCAESP301	Essential Studies for Professionals - III	2	0	0	2	0.5
Total of Theory						18	15.5
PRACTICAL							
6	MCA391	Operating Systems Laboratory (Unix)	0	0	2	2	3
7	MCA394	Software Project Management Laboratory	0	0	2	2	3
8	MCA396	Data Science & Data Analytics Laboratory (PYTHON)	0	0	2	2	3
Total of Practical						6	9
SESSIONAL							
9	MCA383	Environment & Ecology	2	0	0	2	2
10	MCASDP381	Skill Development for Professionals - III	2	0	0	2	0.5
11	MCA381	Industrial Training	0	0	0	0	2
12	MCA382	Minor Project	0	0	0	0	6
13	MCA384	Seminar	0	0	0	0	1
14	MAR	Mandatory Additional Requirements	0	0	0	0	0
15	MOOCS	Massive Open Online Courses	0	0	0	0	0
Total of Sessional						4	10.5
Total of Semester						28	35

Subject Name: Operating System and System Software **Credit: 04**

Subject Code: MCA301& MCA391 **LectureHours: 3L + 1T**

Name of the Course: Operating System and System Software / Operating Systems Laboratory (Unix)	
CourseCode:MCA301& MCA391	**Semester: 3**
Duration: 40 Hrs.	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory: 3L	End Semester Exam:100
Tutorial: 1T	Continuous Assessment:100
Practical:2	Practical Sessional Internal continuous evaluation:100
Credit: 4 +2	Practical Sessional external examination:100
Aim:	
Sl. No.	
1	To understand the system architecture of an operating system
2	Ability to apply CPU scheduling algorithms to manage tasks.
3	Initiation into the process of applying memory management methods and allocation policies.
4	Knowledge of methods of prevention and recovery from a system deadlock.
Objective:	
Sl.No.	

1	To deliver a detailed knowledge of integral software in a computer system –Operating System.
2	To understand the workings of an operating system as a resource manager.
3	To familiarize the students with Process and Memory management.
4	To describe the problem of process synchronization and its solution.
Pre-Requisite:	
Sl.No.	
1.	You should know about Computer Architecture and Organization.
2	Proficiency in C or another programming language.
3	Familiarity with Assembly language.
CourseOutcome:	
1.	Understand Operating System Concepts: Gain knowledge about operating system functions, generations, processes, and threads.
2.	Develop Process Scheduling Algorithms: Create algorithms for process scheduling, considering CPU utilization, throughput, turnaround time, waiting time, and response time.
3.	Identify the deadlock situation and provide an appropriate solution so that the protection and security of the operating system are also maintained.
4.	Learn File Handling and Process Control: Understand the basics of File, Device, and Disk Storage Management
RelevantLinks:	
OSStudyMaterial	OS NPTELLINK OS CourseraLink OSLinkedInLearningLink

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	0	0	1	1	0	3	2	0	1
CO2	3	3	3	2	2	1	0	0	1	1	0	2	3	1	1

CO3	3	3	2	2	2	2	1	2	1	1	0	2	3	1	1
CO4	3	2	3	1	2	1	0	0	1	1	0	3	3	0	1

Legend:

- **PO1:** Application of Knowledge
- **PO2:** Problem Analysis
- **PO3:** Development of Solutions
- **PO4:** Conduct investigations of complex problems
- **PO5:** Modern Tool Usage
- **PO6:** Impact on Society
- **PO7:** Environment and sustainability
- **PO8:** Ethics
- **PO9:** Individual and team work
- **PO10:** Communication
- **PO11:** Project management and finance
- **PO12:** Continuous Learning
- **PSO1:** Advanced Software Development and Engineering Skills
- **PSO2:** Data Analysis and Management Expertise
- **PSO3:** Research and Innovation Proficiency

This table reflects the relevance of each course outcome to the program outcomes and program-specific outcomes on a scale from 0 (No relevance) to 3 (High relevance)

Module number	Topic	Sub-topics	MappingwithIndustry and International Academia	Lecture Hours	CorrespondingLabAssignment
1	Introduction	1. Introduction to Operating Systems 2. Hardware Support for Operating Systems 3. Resource Management 4. Operating System Architectures	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***IndustryMapping:***The concepts delivered are in sync with the industry standards	4	• Basic Unix Commands
2	**Process Management**	5. Fundamentals of Process Management 6. Process Scheduling 7. Process Communication and Synchronization 8. Deadlocks 9. Multi-threading	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***IndustryMapping:***The concepts delivered are in sync with the industry standards	8	• C Programs for Process Scheduling • Implementation of Banker's Algorithm

3	**Memory Management**	10. Basic Memory Management 11. Virtual Memory	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***IndustryMapping:***The concepts delivered are in sync with the industry standards	8	• C programs to simulate contiguous memoryallocation techniques • C programs to simulate the paging technique
4	**File Management**	12. File Systems 13. File System Implementation	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***IndustryMapping:***The concepts delivered are in sync with the industry standards	7	• Unix commands on file operations • C program for file organization technique.

5	**Input –Output Management**	14. Basics of I/O Management 15. Disk Management	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***IndustryMapping:***The concepts delivered are in sync with the industry standards	7	• C programs to simulate disk scheduling algorithms
6	**Security and Protection** **Advanced Operating System**	16. Security Issues 17. Protection Mechanisms 18. Distributed Operating Systems	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***IndustryMapping:***The concepts delivered are in sync with the industry standards	6	• Advanced Unix commands

ListofBooksTextBooks:			
Nameof Author	**Title oftheBook**	**Edition/ISSN/ISBN**	**NameofthePublisher**
Naresh Chauhan	Principles of Operating Systems (Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18)	1st Ed/ 9780198082873	Oxford University Press
ReferenceBooks:			
Abraham Silberschatz, Peter B. Galvin	Operating System Concept	9th Ed/ 9788126554270	WILEY
Andrew S. Tanenbaum	Modern Operating Systems	4th Ed/ 9789332575776	Pearson Education India
William Stallings	Operating Systems	9th Ed/ 9789352866717	Pearson Education
Sumitabha Das	UNIX: Concepts and Applications (Lab Reference)	4th Ed/ 9780070635463	McGraw Hill Education

Subject Name: Software Engineering & TQM Credit: 4 Lecture Hours: 4

Subject Code: MCA304

Name of the Course: Software Engineering & TQM		
Course Code: MCA304, MCA394		**Semester: 3rd**
Duration: 40 Hrs.		**Maximum Marks:100**
Teaching Scheme		**Examination Scheme**
Theory: 3		End Semester Exam:100
Tutorial: 1		Continuous Assessment:100
Practical:2		Practical Sessional internal continuous evaluation:100
Credit:4+2		Practical Sessional external examination:100
Aim:		
Sl.No.		
1	Togain knowledge of various aspects of software engineering project management.	
2	To enhance ability to identify qualities of a good solution	
3	To implement learned algorithm/design techniques t osolve problems	
Objective:		
Sl.No.		
1	The fundamental knowledge of software engineering	
2	The different basic models need to implement different project problems	

3	The various design methods to develop the software system
4	The quality and other issues related to the software products and systems
Pre-Requisite:	
Sl.No.	
1.	Knowledge in fundamental theories of computer science and one programming language
CourseOutcome:	
1.	On completion of this course students are expected to learn fundamentals and different models of software engineering.
2.	On completion of this course students are expected to learn different aspects of requirement analysis in software project management.
3.	On completion of this course students are expected to learn various types of software design and concepts of coding.
4.	On completion of this course students are expected to learn different types of testing and quality issues.
RelevantLinks:	
SE Study Material	SE NPTELLINK SE CourseraLink SELinkedInLearningLink

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**1**		**2**	**1**	**1**		**1**							
CO2	**1**	**3**	**2**	**1**	**1**		**1**								

CO 3		**1**	**2**	**2**	**1**	**1**		**1**							
CO 4	**1**	**1**	**2**	**1**	**3**		**1**								

Module number	**Topic**	**Sub-topics**	**Mapping withIndustry andInternational Academia**	**LectureHours**	**CorrespondingLabAssignment**
1	**IntroductionandSoftwareProcessModels**	Software,SoftwareEngineering,Myths,SoftwareProcess,WorkProducts, Importanceof SoftwareEngineering,StandardforSoftwareProcess,WaterfallModel, PrototypingModel,IterativeEnhancementModel,SpiralModel,RADmodel.	***InternationalAcademia:***(https://ocw.mit.edu/courses/16-355j-software-engineering-concepts-fall-2005/pages/lecture-notes/) ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***IndustryMapping:***IEEESRS standard,RationalRose,Reqview, Jirasoftware,Axosoft.	8	1. Make a comparative studies of different models of software development process.

2	**RequirementEngineeringandSoftwareProjectManagement**	SoftwareRequirements,TypesofRequirements, RequirementEngineeringCycle,RequirementsSpecification document,CharacteristicsofRequirements,Requirementverificationandvalidation,RoleofManagementinSoftwareDevelopment,ProjectEstimationTechniques,Staffing,Scheduling, Earned Value Analysis,Software Risks, SoftwareConfiguration Management,SoftwareProcessandProject metrics.	**InternationalStandards**https://ocw.mit.edu/courses/16-355j-software-engineering-concepts-fall-2005/pages/lecture-notes/)	12	1. Write an SRS. 2. Compute function points using the method of FPA to determine the cost of s/w project 3. Implement COCOMO using the different formulas 4. Implement Gantt Chart and determine milestones 5. Implement

					PERT-CPM method

			AICTEprescribedsyllabus:(https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***IndustryMapping:***MSproject, ProjectLibre,FunctionPointmodeler.		
3	**SoftwareDesignandCoding**	Process,DataandBehaviouralModelling,DesignConcepts,Modularity,Architecturaldesign,CouplingandCohesion,Top-downandbottom-updesign,Object-orientedAnalysis,Function-oriented and Object-Oriented Designapproach,SoftwareDesignDocument,Codingstylesanddocumentation,	***InternationalStandards***:(https://ocw.mit.edu/courses/16-355j-software-engineering-concepts-fall-2005/pages/lecture-notes/) ***AICTEprescribedsyllabus:(***https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***IndustryMapping:***IEEE SDDdocument.Smartdraw,VisualParadigm/MicrosoftVisio/MSProject/Umbrello/Rational Rose.	8	1. Implement the Cyclomatic Complexity of coding 2. Implement and evaluate the Halstead's Metrics of Coding 3. 3. Implement Dharma's metrics 4. Implement polymorphism factor formula 5. Implement inheritance formula

4	**Testingand dSoftware Quality**	Testingprinciples,testingstrategies, Black-boxandWhite-boxTestingTechniques,Levelsoftesting-unit,integration,system,regression,TestPlan,TestCasesSpecification,Softwaredebugging,SoftwareMaintenance,SoftwareQualityFactors,ISO,SEICMM,CMMI,SoftwareReliability.Software Availability.	***InternationalStandards:***(https://ocw.mit.edu/courses/6-170-laboratory-in-software-engineering-fall-2005/pages/assignments/) ***AICTEprescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***IndustryMapping:*** Eclipse,Bugzilla,Mantis BT,JiraSoftware.	12	1. Implement H-K information factor. 2. Implement EMV method

List of Books/Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Rajib Mall	Fundamentals of Software Engineering(Chapter No. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12)	4th edn	PHI
ReferenceBooks:			
Roger S. Pressman	Software Engineering, A Practitioners Approach(Chapter No. 8, 10, 14, 16, 26, 28)	7th edn	MGH

NPTEL Course Link

https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc24_cs119/preview&sa=D&source=editors&ust=1716398261150955&usg=AOvVaw3YEMH0X0saJMUzUGM6pmvo

LinkedIn Course Link

https://www.linkedin.com/learning/project-management-foundations-quality-2020/managing-project-quality?courseClaim=AQHmHtO1iPJaogAAAY-mAcZxprYWpzmIpJf6paTooYjxcr45mEiJ1BhW4dAA36jI8-VlyuwZWjNM0zfDpX1cUix10J7drpSo9ZQr-m1

Coursera Course Link

https://www.coursera.org/learn/introduction-to-software-engineering

https://www.coursera.org/specializations/software-engineering-fundamentals

https://www.coursera.org/specializations/software-engineering

Subject Name: Data Science and Data Analytics Credit: 4 Lecture Hours:40 Subject Code: MCA306

Name of the Course:Data Science and Data Analytics	
Course Code: MCA306 &MCA395	**Semester: 3rd**
Duration: 40Hrs.	**MaximumMarks: 100**
Teaching Scheme	**Examination Scheme**
Theory:3	End Semester Exam:100
Tutorial: 1	Continuous Assessment:100
Practical:2	Practical Sessional internal continuous evaluation:100
Credit:4+3	Practical Sessional external examination:100
Aim:	
Sl.No.	
1	To gain Knowledge of Various aspects of data science and data analytics.
2	To enhance the ability to identify qualities of a good solution of AI, Big Data, Data Mining etc.
3	To implement learned analytical techniques and data science to solve problems.
Objective:	
Sl.No.	
1	Provide you with the knowledge and expertise to become a proficient data scientist.
2	Demonstrate an understanding of statistics and machine learning concepts that are vital for data science.

3	Produce Python code to statistically analyze a dataset.
4	Critically evaluate data visualizations based on their design and use for communicating stories from data.
Pre-Requisite:	
Sl.No.	
1.	Proficiency in data related to AI,ML,Big Data etc.
Course Outcome:	
1.	Explain how data is collected, managed and stored for data science.
2.	Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
3.	Implement data collection and data mining techniques using database.
4.	Understand handling of big data.
Relevant Links:	
DSDAStudyMaterial	DSDA NPTELLINK DSDA CourseraLink DSDA LinkedInLearningLink

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1		2	1	1		1	-	-	-	-	-	-	-
CO2	1	3	2	1	1		1		-	-	-	-	-	-	-
CO3		1	2	2	1	1		1	-	-	-	-	-	-	-
CO4	1	1	2	1	3		1		-	-	-	-	-	-	-

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Data Management:	Brief idea about Data Warehousing, Architecture and Data Flows, Data pre-processing before analysis, Data preparation, OLAP & OLTP, Case study.	***International Academia:*** https://ocw.mit.edu/courses/res-str-002-data-management-spring-2016/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	1. Write a program for displaying reversal of a number. 2. Implement python script to read person's age from keyboard and display whether he is eligible for voting or not. 3. Implement python script to check the given year is leap year or not. 4. Implement Python Script to generate prime numbers series up to n 5. To display elements of list in reverse order. 6. Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it. 7. Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

					8. Implement a python script for factorial of number by using recursion.
2	Introduction to Data Mining:	Brief idea about Data Mining, It's goals and techniques, Architecture and KDD Process, Knowledge representation methods.	***International Academia:*** https://ocw.mit.edu/courses/15-062-data-mining-spring-2003/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	1. Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34',67', '55', '33', '12', '98'). 2. Write Python script to copy file contents from one file to another. 3. Implement a python script to check the element is in the list or not by using Linear search & Binary search. 4. Implement a python script to arrange the elements in sorted order using Bubble, Selection, Insertion and Merge sorting techniques.

					5. Write a python program by using exception handling mechanism. 6. Write a python program to perform various database operations (create, insert, delete, update).
3	Statistics and Analytics:	Data Visualization, Summarize and describe data sets using a measures such as Central tendency and variability, Learn probability, Central Limit Theorem and much more to draw inferences	***International Academia:*** https://ocw.mit.edu/courses/15-071-the-analytics-edge-spring-2017/pages/visualization/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	6	1. Write a program to compute summary statistics such as mean, median, mode, standard deviationand variance of the given different types of data. 2. Write a program to demonstrate Regression analysis with residual plots on a given data set.

4	Introduction to Big Data Analytics:	Understand the basic concepts of Big Data and Hadoop as processing platforms for Big Data, Managing Big Data - Learn and Use Hadoop Ecosystem tools for data ingestion, extraction and management. Introduction to Hive.	***International Academia:*** **https://prolearn.mit.edu/data-science-and-big-data-analytics-making-data-driven-decisions** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	
5	Cloud Computing:	Introduction to Cloud Computing, types, services, applications, Security & research scope. Internet of Things:	***International Academia:*** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	

6	Introduction to IOT and WSN:	Introduction to IOT and WSN, Basic concepts of Robotics Using Arduino & Rasberry Pi Programming.	***International Academia:*** **https://professionalprograms.mit.edu/online-program-internet-of-things/** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf
7.	Introduction to NLP & AI	Introduction to artificial intelligence, Brief idea about Natural Language Processing.	***International Academia:*** https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	Python lab for text analysis 1. Choose some book-length document and download it. 2. Count its characters, lines and words. 3. Count sentences, vocabulary, and the like. 4. Show collocations, common context, concordance, and similar relationships among the words. 5. Plot a lexical dispersion or two. 6. Plot a frequency distribution of the most common words.

8.	Basic concepts of Machine Learning	To implement linear regression, Data classification, Data clustering – To learn how to create segments based on similarities using K-Means and Hierarchical clustering, Case study using Python.	***International Academia:*** **https://openlearninglibrary.mit.edu/courses/course-v1:MITx+6.036+1T2019/about** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	1. Write a program to demonstrate the working of the decision tree-based ID3 algorithm. 2. Write a program to implement the Naïve Bayesian classifier for a sample training data set stored as a .CSV file.
9.	Applications of Machine Learning.	Time series, Decision trees, Support Vector Machine, Neural Networks, Case Study Using MATLAB.	***International Academia:*** **https://openlearninglibrary.mit.edu/courses/course-v1:MITx+6.036+1T2019/about** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	6	1. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. 2. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file.

List of Books Textbooks :			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Jiawei Han and Micheline Kamber	"Data Mining : Concepts and Techniques"	4th Edition	"Morgan Kaufman"
Amit Konar	"Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain"		CRC Press
Anil Maheshwari	"Big Data"	2nd Edition	Tata McGraw Hill
Rajkumar Buyya	"Mastering Cloud Computing : Foundations and Applications Programming"		"Morgan Kaufman"
Steven Bird, Ewan Klein and EdwardLoper	"Natural Language Processing with Python"		O'Reilly
Martin C. Brown	"The Complete Reference Python"		Tata McGraw Hill
L.Fausett	"Fundamentals of Neural Networks:" Architectures, Algorithms and Applications		Pearson

NPTEL Course Link

https://archive.nptel.ac.in/courses/106/106/106106212/

LinkedIn Course Link

https://www.linkedin.com/learning/paths/master-python-for-data-science-16361344

Coursera Course Link

https://www.coursera.org/learn/python-data-analysis

https://www.coursera.org/learn/python-machine-learning

https://www.coursera.org/learn/python-text-mining

Subject Name: Statistics and Numerical Techniques Credit: 4 Lecture Hours: 48

Subject Code: MCA307

Name of the Course: Statistics and Numerical Techniques	
Course Code: MCA307	**Semester: 3rd**
Duration: One Semester	**Maximum Marks:100**
Teaching Scheme: Lecture method	**Examination Scheme**
Theory: 03 L	End Semester Exam:100
Tutorial: 01 L	Continuous Assessment:100
Credit: 4	
Aim:	
Sl.No.	
1	Equip students with the skills to collect, organize, and summarize data effectively, enabling them to understand the fundamentals of descriptive and inferential statistics.
2	Provide students with the knowledge of numerical techniques for solving complex mathematical problems, fostering proficiency in methods such as root finding, interpolation, and numerical integration.
3	Enable students to apply statistical and numerical methods to real-world scenarios across various disciplines, promoting critical thinking, problem-solving, and ethical data practices.
Objective:	
Sl.No.	
1	Develop students' understanding of different data types and the ability to collect, organize, and summarize data effectively, using descriptive statistics techniques.

2	Enable students to grasp the principles of statistical inference, including hypothesis testing, confidence intervals, and regression analysis, to draw meaningful conclusions from sample data about populations.
3	Equip students with proficiency in numerical techniques such as root finding, interpolation, and numerical integration, enabling them to solve complex mathematical problems encountered in various disciplines.
4	Foster the application of statistical and numerical methods in practical scenarios across diverse fields, through case studies and hands-on exercises, promoting critical thinking, problem-solving, and ethical data practices.
Pre-Requisite:	
Sl.No.	
1.	Basic knowledge of senior secondary and under graduate levels mathematics.
CourseOutcome:	
1.	Upon completion of the course, students will demonstrate proficiency in collecting, analyzing, and interpreting data using appropriate statistical techniques, enhancing their ability to make informed decisions based on empirical evidence.
2.	Students will be able to apply numerical techniques like interpolation and numerical integration to solve complex mathematical problems encountered in engineering, science, and other disciplines, effectively utilizing computational tools to address real-world challenges.
3.	Students will be able to apply numerical techniques like solution of equation and system of linear equations to solve complex mathematical problems.
4.	At the end of the course, students will be able to apply numerical methods like numerical solution of ODE to solve complex mathematical problems encountered in engineering, science, and other disciplines to address day-to-day life critical problems.
Relevant Links:	
Study Material	NPTELLINK CourseraLink LinkedInLearningLink

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	-	3	2	-	-	-	-	-	-	-			
CO 2	3	2	-	2	3	-	-	-	-	-	-	-			
CO 3	3	3	-	2	3	-	-	-	-	-	-	-			
CO 4	3	3	-	2	3	-	-	-	-	-	-	-			

Module number	Topic	Sub-topics	MappingwithIndustry and International Academia	Lecture Hours
1	Statistics, Probability and Distribution	Statistics - measure of central tendency, dispersion (Moments, Skewness & Kurtosis). Least square curve fitting - linear & non-linear. Probability, introduction to mass function, density function, distribution function (Binomial, Poisson, Normal), estimation of parameters (unbiasedness-concept of noise/error, consistency).	**Industry Mapping:**https://www.sagemath.org/, MATLAB **International Academia:** https://ocw.mit.edu/courses/18-440-probability-and-random-variables-spring-2014/pages/lecture-notes/ , https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	16

2	Interpolation and Numerical Integration	Interpolation-Newton's Forward, Backward, Sterling & Bessel's Interpolation formulae, Lagrange's Interpolation. Inverse Interpolation. Integration - Trapezoidal, Simpson's 1/3rd, Weddle's Rule, Romberg Integration, Gauss- Legendre two &three points formula, Newton Cotes Formula.	**Industry Mapping:** https://www.sagemath.org/ ,MATLAB **International Academia:** https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	12
3		Solution of any equation - Method of Iteration, Method of Bisection, Newton-Raphson Method, Regula-Falsi method and Secant Method. Solution of system of linear equations- Gauss Elimination Method, Gauss-Jacobi, Gauss-Seidel, LU factorization and Tri-diagonalization.	**Industry Mapping:** https://www.sagemath.org/ , MATLAB **International Academia:** https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	12
4		Solution of differential equations - Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.	**Industry Mapping:**https://www.sagemath.org/ , MATLAB **International Academia:** https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	8

List of Books/Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
B. S. Grewal	Higher Engineering Mathematics	44th Edition	Khanna Publishers
ReferenceBooks:			
Dr. Hari Arora	PROBABILITY AND STATISTICS	3rd Edition	S.K. KATARIA & SONS
K. DAS	NUMERICAL METHODS	2nd Edition	U.N.DHUR & SONS PRIVATE LTD.
B.K. PAL & K. DAS	ENGINEERING MATHEMATICS Volume - IIA	1st Edition (2021)	U.N.DHUR & SONS PRIVATE LTD.
Madhumangal Pal	Numerical Analysis for Scientists and Engineers: Theory and C Programs	1st Edition (2007)	Alpha Science International Ltd

Subject Name: Environment and Ecology Credit: 3 Lecture Hours: 36

Subject Code: MCA383

Name of the Course: **ENVIRONMENT AND ECOLOGY**	
Course Code:MCAN383	**Semester: THIRD**
Duration: 36	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory: 1	End Semester Exam:100
Tutorial: 1	Continuous Assessment:100
Credit: 2	
Aim:	
Sl.No.	
1	Imparting knowledge about the environment and ecosystem around us.
2	Imparting knowledge about the natural resources, biodiversity, and the importance of their conservation
3	Environmental Management and Pollution Control
Objective:	
Sl.No.	
1	Students will gain knowledge about the environment and ecosystem.
2	Students will learn about natural resources, biodiversity, and the importance of their conservation

3	To make students aware of problems of environmental pollution, its impact on humans and the ecosystem, and control measures.
4	At the end of the course, students will learn about waste disposal measures and environmental management.
Pre-Requisite: NA	
Sl.No.	
1.	
CourseOutcome:	
1.	Define Environmental factors and the basic components of the ecosystem.
2.	Understand and explain the importance of Plantation.
3.	List the pollutants and analyze the importance of reducing/ controlling environmental pollution.
4.	Analyze the importance of Biohazards, Environmental and Social Safety
RelevantLinks:	https://onlinecourses.nptel.ac.in/noc23_hs155/preview https://www.coursera.org/learn/environmental-science
EVS Study Material	EVS NPTELLINK EVS CourseraLink EVSLinkedInLearningLink

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	1	3	3	2	1	2	1	2	2	2	3	2	1	2	2

CO 2	3	2	3	2	2	3	1	2	2	1	1	1	3	1	3
CO 3	2	2	1	3	1	2	3	3	1	1	2	3	3	3	1
CO 4	1	3	1	3	3	2	2	3	2	3	2	1	1	1	2

Module number	Topic	Sub-topics	MappingwithIndustry and International Academia	Lecture Hours
I	**Overview**	Basic ideas of environment, basic concepts, man, society & environment, their interrelationship Mathematics of population growth and associated problems, Importance of population study in environmental engineering, the definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step function. Importance, scope and principles of EIA.	***International Academia:*** https://online.stanford.edu/courses/xeiet100-clean-renewable-energy-storage-sustainable-future ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** https://cbs.umn.edu/populus/downloadplant(WWTP) .	6

II	**Ecology**	Elements of ecology: System, open system, closed system, the definition of ecology, species, population, community, definition of ecosystem- components types and function. (1L) Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web.(2L) Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. (1L) Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.(2L)	***International Academia:*** ***https://ocw.mit.edu/courses/1-020-ecology-ii-engineering-for-sustainability-spring-2008/*** ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** ***https://vsni.co.uk/solutions/ecology*** ***https://www.helsinki.fi/en/researchgroups/statistical-ecology/software***	6
III	**Air Pollution**	Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. (1L) Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.(1L) Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.(1L) Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).(2L) Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.(2L) Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteriapollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. (2L) Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of	***International Academia:*** https://ocw.mit.edu/courses/1-84j-atmospheric-chemistry-fall-2013/pages/lecture-notes/ ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** https://www.who.int/europe/tools-and-toolkits/airq---software-tool-for-health-risk-assessment-of-air-pollution	6

		other green-house gases, effect of ozone modification. (1L) Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). (1L)		
IV	**Water Pollution**	Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenating, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Waste water standard [BOD, COD], Water Treatment system,primary and secondary treatments, tertiary treatment definition.Water pollution due to the toxic elements. USEPA and WHO guidelines for drinking water.	***International Academia:*** ***https://online.stanford.edu/courses/cee270m-aquatic-and-organic-chemistry-environmental-engineering*** ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** *Activated Sludge Simulation (ASIM), Sewage Treatment Operation and Analysis Over Time (STOAT), and GPS-X are the common softwares used for waste water treatment plant(WWTP).*	6
V	**Lithosphere**	Lithosphere; Internal structure of earth, rock and soil (1L).Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).(2L)	***International Academia:*** ***https://ocw.mit.edu/courses/1-34-waste-containment-and-remediation-technology-spring-2004/*** ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** ***https://www.wasteworksonline.com/***	6

VI	**Noise pollution**	Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] (1L) Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18hr Index) ,n Ld.Noise pollution control. (1L)	***International Academia:*** ***No link found*** ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** No software found	3
VII	**Environmental Management**	Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. (2L)	***International Academia:*** ***https://ocw.mit.edu/courses/11-601-introduction-to-environmental-policy-and-planning-fall-2016/*** ***AICTE-prescribedsyllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** ***https://www.intelex.com/products/environment/***	3

List of Books/Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
MP Poonia, SC Sharma, S. Kumar	Environmental Studies (AICTE Textbook)	3rd- 2021/ 978-9390779024	Khanna Book Publishing Co.
Reference Books:			
NA			