



Dr. N.G.P. ARTS AND SCIENCE COLLEGE

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)
Approved by Government of Tamil Nadu & Accredited by NAAC with A++ Grade (3rd Cycle - 3.64 CGPA)
Dr. N.G.P. - Kalapatti Road, Coimbatore – 641 048, Tamil Nadu, India
Web : www.drngpasc.ac.in | Email : info@drngpasc.ac.in | Phone : +91-422-2369100

REGULATIONS 2022-23 for Under Graduate Programme (Outcome Based Education model with Choice Based Credit System) Bachelor of Science in Computer Science with Data Analytics Degree (For the students admitted during the academic year 2022-23)

Programme: B. Sc. (Computer Science with Data Analytics)

Eligibility

Candidates for admission to the first year of the **Bachelor of Science (Computer Science with Data Analytics)** Degree Programme shall be required to have passed in the Higher Secondary Examinations conducted by the Government of Tamil Nadu in the relevant subjects or an Examination accepted as equivalent there to by the Academic Council. Subject to such other conditions as may be prescribed there to are permitted to appear and qualify with any one of the following subjects: Mathematics / Computer Science / Statistics / Business Mathematics and wherever the students have not studied Mathematics, the necessary Mathematics knowledge be imparted through Tutorial/ Bridge Course.

Programme Educational Objectives

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. Demonstrate expertise to solve diverse range of problems in computer science.
2. Exhibit skills for employment in industries especially in the field of Data Analytics.
3. Practice professional ethics and remain socially responsible.
4. Involve in life-long learning by adapting contemporary technologies, tools and Methodologies.
5. Progress towards higher studies and entrepreneurship



PROGRAMME OUTCOMES

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	Ability to apply knowledge of Computer science and mathematics to identify problems and model solutions
PO2	Ability to analyze large data sets in the context of real world problems and interpret results
PO3	Ability to Design, Implement and Evaluate solutions for computing problems
PO4	Ability to apply current techniques, skills and tools necessary for data analytics
PO5	Ability to exhibit soft skills and understand professional and social responsibilities



B.Sc. Computer Science with Data Analytics Credit Distribution

Part	Subjects	No. of Papers	Credit	Semester No.
I (12 Credits)	Tamil / Hindi / French/Malayalam	4	4 x 3 = 12	I to IV
II (12 Credits)	English	4	4 x 3 = 12	I to IV
III (108 Credits)	Core (Credits 4)	11	11 x 4 = 44	I to VI
	Core (Credits 3)	2	2 x 3 = 6	I to VI
	Core (Credits 5) (Embedded- Core)	2	2 x 5 = 10	III to IV
	Core Project (Credits 4)	1	1 x 4 = 4	VI
	Core Practical (Credits 2)	4	3 x 2 = 8	I to VI
	Inter Departmental Course (IDC)	4	4 x 4 = 16	I to IV
	Discipline Specific Elective (DSE)	3	3 x 4 = 12	V & VI
	Skill Enhancement Course (SEC)	4	4 x 2 = 8	III, IV, V & VI
	Industrial Training	1	1 x 2 = 2	V
IV (8 Credits)	Environmental Studies (AECC)	1	2	I
	Basic Tamil/Advance Tamil/Human Rights, & Women's Rights (AECC)	1	2	II
	Innovation & IPR/ Innovation, IPR & Entrepreneurship (AECC)	1	2	VI
	Generic Elective (GE)	1	1 x 2 = 2	V
V (2 Credits)	NSS/NCC/YRC/RRC/Yoga/Sports	-	2	I - II
TOTAL CREDITS			142	




CURRICULUM
B.Sc. COMPUTER SCIENCE WITH DATA ANALYTICS PROGRAMME

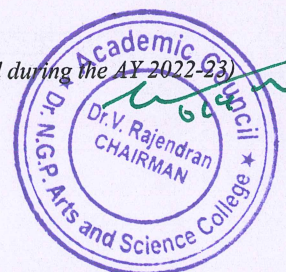
Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part- I										
221TL1A1TA	Language-I	Tamil-I : Ikkala Ilakkiyam	4	1	-	3	50	50	100	3
221TL1A1HA		Hindi-I : Modern Literature								
221TL1A1MA		Malayalam-I : Modern Literature								
221TL1A1FA		French -I: Grammar, Translation and Civilization								
Part- II										
221EL1A1EA	Language-II	Professional English -I	4	-	1	3	50	50	100	3
Part- III										
224AI1A1CA	Core - I	Problem Solving and Programming in C	4	1	-	3	50	50	100	4
224DA1A1CP	Core Practical - I	C Programming	-	-	4	3	50	50	100	2
224IT1A1CA	Core - II	Digital Computer Fundamentals	4	-	-	3	50	50	100	4
222MT1A1ID	IDC - I	Mathematics for Computing-I	4	1	-	3	50	50	100	4
Part-IV										
223MB1A1AA	AECC-I	Environmental Studies	2	-	-	-	50	-	50	2
Part-V										
224DA1A1XA	Extension Activity	NSS/NCC/ YRC/RRC/ Yoga/Sports/ Clubs	-	-	-	-	50	-	50	1
Total			22	3	5	-	-	-	700	23

Dr. NGPASC

BoS Chairman/HoD
 Department of Computer Science with Data Analytics
 Dr. N. G. P. Arts and Science College
 Coimbatore - 641 048


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 Dr. N. G. P. Arts and Science College B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)		
APPROVED		
BoS- 6th	AC- 13th	GB- 18th
29.07.22	06.09.22	10.09.22



Course Code	Course Category	Course Name	L	T	P	Exam (hrs)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
Part-I										
221TL1A2TA	Language-I	Tamil-II : Ara Ilakkiyam	4	1	-	3	50	50	100	3
221TL1A2HA		Hindi-II : Modern Literature								
221TL1A2MA		Malayalam-II : Modern Literature								
221TL1A2FA		French -II : Grammar, Translation and Civilization								
Part- II										
221EL1A2EA	Language-II	Professional English -II	4	-	1	3	50	50	100	3
Part- III										
224CA1A2CA	Core - III	Data Structures	4	1	-	3	50	50	100	4
224CS1A2CA	Core - IV	Object Oriented Programming with C++	4	-	-	3	50	50	100	4
224DA1A2CP	Core Practical - II	Data Structures and C++	-	-	4	3	50	50	100	2
222MT1A2ID	IDC - II	Mathematics for Computing - II	4	1	-	3	50	50	100	4
Part-IV										
221TL1A2AA	AECC-II	Basic Tamil	2	-	-	-	50	-	50	2
221TL1A2AB		Advanced Tamil								
225CR1A2AA		Human Rights and Women's Rights								
Part-V										
224DA1A2XA	Extension Activity	NSS/NCC/ YRC/RRC/ Yoga/Sports/ Clubs	-	-	-	-	50	-	50	1
Total			22	3	5	-	-	-	700	23

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 BoS Chairman/HoD
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APPROVED		
BoS - 7 th	AC - 14 th	GB - 19 th
02.12.22	19.01.23	30.01.23




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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
Part – I										
221TL1A3TA	Language-I	Tamil-III	3	1	-	3	50	50	100	3
221TL1A3HA		Hindi-III								
221TL1A3MA		Malayalam-III								
221TL1A3FA		French -III								
Part – II										
221EL1A3EA	Language-II	Professional English -III	3	1	-	3	50	50	100	3
Part – III										
224DA1A3CA	Core-V	Database System Concepts	4	-	-	3	50	50	100	4
224CS1A3CA	Core -VI	Operating Systems	3	-	-	3	50	50	100	3
224AI1A3CP	Core Practical - III	Programming in Java	3	-	4	3	50	50	100	5
224DA1A3SP	SEC - I	Database Systems	-	-	4	3	50	50	100	2
222MT1A3ID	IDC -III	Discrete Mathematics	4	-	-	3	50	50	100	4
Total			20	02	08	-	-	-	700	24


 9/6/23
BoS Chairman/HoD
 Department of Computer Science with Data Analytics
 Dr. N. G. P. Arts and Science College
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APPROVED		
BoS- 8 th 09.06.23	AC- 15 th 14.07.23	GB- 20 th 09.08.23




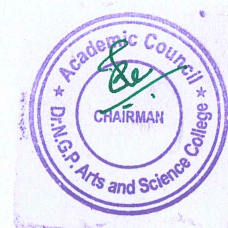
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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ES	Total	
Fourth Semester										
Part – I										
221TL1A4TA	Language-I	Tamil-IV	3	1	-	3	50	50	100	3
221TL1A4HA		Hindi-IV								
221TL1A4MA		Malayalam-IV								
221TL1A4FA		French –IV								
Part – II										
221EL1A4EA	Language-II	Professional English -IV	3	1	-	3	50	50	100	3
Part – III										
224AI1A4CA	Core -VII	Foundations of Artificial Intelligence	4	-	-	3	50	50	100	4
224IT1A4CA	Core VIII	Software Engineering	3	-	-	3	50	50	100	3
224DA1A4EP	Embedded Practical	Python for Data Science	3	-	4	3	50	50	100	5
224DA1A4SP	SEC - II	Data Mining	-	-	4	3	50	50	100	2
225CO1A4IA	IDC - IV	Customer Relationship Management	4	-	-	3	50	50	100	4
Total			20	02	08	-	-	-	700	24

BoS
16/10/23
BoS Chairman/HoD
Department of Computer Science with Data Analytics
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

 Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- <i>9th</i> 16.10.23	AC - <i>16th</i> 13.12.23	GB - <i>21st</i> 05.01.24



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Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part-III										
224DA1A5CA	Core – IX	Computer Networks and Communication	4	1	-	3	50	50	100	4
224DA1A5CB	Core – X	R Programming	4	1	-	3	50	50	100	4
224DA1A5CC	Core - XI	Big Data Technologies	4	1	-	3	50	50	100	4
224DA1A5CP	Core Practical - III	Big Data Technologies	-	-	4	3	50	50	100	2
224DA1A5SP	SEC Practical-III	Web Designing	-	-	4	3	50	50	100	2
224DA1A5DA	DSE –I	Cloud Computing	4	1	-	3	50	50	100	4
224DA1A5DB		Parallel and Distributed Computing								
224DA1A5DC		Text Analytics								
224DA1A5TA	IT	Industrial Training	-	-	-	3	50	50	100	2
Part- IV										
	GE		2	-	-	-	50	-	50	2
Total			18	04	08	-	-	-	750	24

[Signature]
 BoS Chairman/In-CD
 Department of Computer Science with Data Analytics
 Dr. N. G. P Arts and Science College
 Coimbatore – 641 048

Dr.N.G.P Arts and Science College		
APPROVED		
BoS- 10th	AC - 17th	SB -
2.4.24	17.4.24	



Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part-III										
224DA1A6CA	Core -XII	Next Generation Databases	4	-	-	3	50	50	100	4
224DA1A6CB	Core -XIII	Artificial Intelligence	4	-	-	3	50	50	100	4
224DA1A6SP	SEC -IV	Data Visualization	-	-	4	3	50	50	100	2
224DA1A6CV	Core – XIV	Project Work	-	-	8	3	50	50	100	4
224DA1A6DA	DSE –II	Data Security and Privacy	4	-	-	3	50	50	100	4
224DA1A6DB		Social Media Analytics								
224DA1A6DC		Healthcare Analytics								
224DA1A6DD	DSE –III	Internet of Things	4	-	-	3	50	50	100	4
224DA1A6DE		Human Computer Interaction								
224DA1A6DF		Ethics for Data Science								
Part - IV										
223BC1A6AA	AECC-III	Innovation, IPR and Entrepreneurship	2	-	-	-	50	-	50	2
Total			18	-	12	-	-	-	650	24
*Grand total									4200	142



DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed elective course during Semesters V & VI

Semester V (Elective I)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	224DA1A5DA	Cloud Computing
2	224DA1A5DB	Web Analytics
3	224DA1A5DC	Text Analytics

Semester VI (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	224DA1A6DA	Data Security and Privacy
2	224DA1A6DB	Social Media Analytics
3	224DA1A6DC	Healthcare Analytics

Semester VI (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	224DA1A6DD	Internet of Things
2	224DA1A6DE	Human Computer Interaction
3	224DA1A6DF	Ethics for Data Science

GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective Course

Semester V

S. No.	Course Code	Name of the Course
1	224DA1A5GA	Introduction to Data Analytics

EXTRA CREDIT COURSES

The following are the courses offered under self study to earn extra credits:

Semester III

S. No.	Course Code	Name of the Course
1	224DA1ASSA	Decision Support Systems
2	224DA1ASSB	Software Testing



CERTIFICATE PROGRAMMES

The following are the programmes offered to earn extra credits:

S. No.	Programme Code and Name	Course Code	Course name
1	4DA6A Diploma in Data Science	224DA6A1CA	Data Science and Python Programming
		224DA6A1CB	Statistical Analysis using R
		224DA6A1CC	Big Data and Visualization
		224DA6A1CP	Python and R Programming Lab



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B.Sc. Computer Science with Data Analytics(Students admitted during the AY 2022-23)

UG - REGULATION (R4)

(Students admitted in the AY 2022-23)

(OUTCOME BASED EDUCATION WITH CBCS)

1. NOMENCLATURE

1.1 Faculty: Refers to a group of programmes concerned with a major division of knowledge Eg. Faculty of Computer Science consists of disciplines like Departments of Computer Science, Information Technology, Computer Technology, Computer Applications, Data analytics, Cognitive Systems and Artificial Intelligence and Machine Learning.

1.2 Programme: Refers to the Bachelor of Science / Commerce / Arts stream that a student has chosen for study.

1.3 Batch: Refers to the starting and completion year of a programme of study. Eg. Batch of 2022-25 refers to students belonging to a 3 year Degree programme admitted in 2022 and completing in 2025.

1.4 Course: Refers to component of a programme. A course may be designed to involve lectures / tutorials / laboratory work / seminar / project work/ practical training / report writing / Viva- voce, etc., or a combination of these, to meet effectively the teaching learning needs.

- a) **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement
- b) **Inter Disciplinary Course (IDC):** A course chosen generally from a related discipline/subject with an intention to seek exposure in the discipline relating to the core domain of the student
- c) **Discipline Specific Elective (DSE) Course:** Elective courses offered under main discipline/ subject of study.
- d) **Skill Enhancement Courses (SEC):** Value-based and/or skill-based courses which are aimed at providing hands-on-training, competencies, skills, etc.
- e) **Ability Enhancement Compulsory Courses (AECC):** Mandatory courses that lead to Knowledge enhancement. Environmental Science, Human Rights and Women's Rights, Basic Tamil/Advanced Tamil, Innovation and IPR/Innovation, IPR and Entrepreneurship.
- f) **Ability Enhancement Elective Course (AEEC)/Generic Elective (GE)** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is Generic Elective.



1.5 Project Work:

Course involving application of knowledge in problem solving / analyzing / exploring a real life situation / difficult problem. The Project work will be given in lieu of a Core paper.

Internship/Industrial Training

Students must undertake industrial / institutional training for a minimum of 15 days during the IV semester summer vacation. The students will submit the report for evaluation during V semester.

1.6 Extra Credits:

Extra credits shall be awarded for achievements in identified Curricular/co-curricular activities executed outside the regular class hours. Extra credits are not mandatory for completing the programme.

2. STRUCTURE OF PROGRAMME

2.1 PART- I: LANGUAGE- I

Tamil or any one of the languages namely Malayalam, Hindi and French will be offered under Part – I in the first four semesters.

2.2 PART- II: LANGUAGE- II

English will be offered during the first four semesters.

2.3 PART- III:

- Core Course
- Inter Departmental Course (IDC)
- Discipline Specific Elective (DSE)
- Skill Enhancement Course (SEC)
- Industrial Training (IT)

2.4 PART- IV:

2.4.1 Ability Enhancement Compulsory Course (AECC):

The Ability Enhancement Compulsory Courses such as i) Environmental Studies, ii) Human Rights and Womens' Rights, iii) Innovation and IPR/ Innovation, IPR and Entrepreneurship are offered during I,II and VI Semester.

Basic Tamil

a) Those who have not studied Tamil up to XII Std and taken a non-Tamil language under Part-I shall take one Basic Tamil course in the second semester.

(OR)

Advanced Tamil



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B.Sc. Computer Science with Data Analytics(Students admitted during the AY 2022-23)

b) Those who have studied Tamil up to XII Std and taken a non-Tamil language under Part-I shall take one Advanced Tamil course in the second semester.

Note: Students who come under the above a+b categories are exempted from Human Rights and Women's Rights in second semester.

Ability Enhancement Elective Course (AEEC)/Generic Elective (GE) An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is Generic Elective offered in V semester. (Theory/Practical/Non-Lab Practical)

2.5 PART- V: EXTENSION ACTIVITIES

The following extracurricular activities like NSS/YRC/NCC/RRC/Yoga/Sports/Clubs are offered under extension activities during semester I & II. Students will be evaluated based on their active participation in any one of the above activities. 75% Attendance is compulsory for extension activity.

3. CREDIT ALLOTTMENT

The following is the credit allotment:

- Lecture Hours (Theory) : 1 credit per lecture hour per week
- Laboratory Hours : 1 credit for 2 Practical hours per week
- Project Work : 1 credit for 2 hours of project work per week

4. DURATION OF THE PROGRAMME

The B.A. /B.Com./B. Sc. Programme must be completed within 3 years (6 semesters) and a maximum of 6 years (12 semesters) from the date of acceptance to the programme. If not, the candidate must enroll in the course determined to be an equivalent by BoS in the most recent curriculum recommended for the Programme.

5.REQUIREMENTS FOR COMPLETION OF A SEMESTER

Every student shall ordinarily be allowed to keep terms for the given semester in a program of his/ her enrolment, only if he/ she fulfills at least seventy five percent (75%) of the attendance taken as an average of the total number of lectures, practicals, tutorials, etc. wherein short and/or long excursions/field visits/study tours organized by the college and supervised by the faculty as envisaged in the syllabus



shall be credited to his/her attendance. Every student shall have a minimum of 75% as an overall attendance.

6. EXAMINATIONS

The end semester examinations shall normally be conducted after completing 90 working days for each semester. The maximum marks for each theory and practical course shall be 100 with the following breakup:

a) Mark distribution for Theory Courses

Continuous Internal Assessment (CIA) : 50 Marks

End Semester Exams (ESE) : 50 Marks

Total :100 Marks

i) Distribution of Internal Marks

S.No.	Particulars	Distribution of Marks
1	CIA I (2.5 Units) (On completion of 45 th working day)	15
2	Model (All 5 Units) (On completion of 85 th working day)	15
3	Assignment	05
4	Attendance	05
5	Library Usage	05
6	Skill Enhancement *	05
Total		50

Assignment Rubric

(Maximum -20 marks converted to 5 marks)

Criteria	4 marks	3 Marks	2 Marks	1 Mark
Language	Excellent spelling and Grammar	Good spelling and Grammar	Reasonable spelling and Grammar	Bad spelling and Grammar
Style	Outstanding style beyond usual college level	Attains College level style	Approaches College level style	Elementary form with little or no variety in



				sentence structure
Referencing	Good use of wide range of reference sources	Moderate use of suitable reference materials	Shows signs of plagiarism & using sources without referencing	No reference material used
Development	Main points well developed with high quality and quantity support	Main points developed with quality and quantity supporting details	Main points are present with limited details and development	Main points lack detailed development
Critical thinking/Problem solving	Advanced attempt to interpret the process, content/ analyse and solve the problem	Proficient attempt to interpret the process, content/ analyse and solve the problem	Adequate attempt to interpret the process, content/ analyse and solve the problem	Limited attempt to interpret the process, content/ analyse and solve the problem

Breakup for Attendance Marks:

S.No	Attendance Range	Marks Awarded
1	95% and Above	5
2	90% - 94%	4
3	85% - 89%	3
4	80% - 84%	2
5	75% - 79%	1

Note:

Special Cases such as NCC, NSS, Sports, Advanced Learner Course, Summer Fellowship and Medical Conditions etc. the attendance exemption may be given by principal and Mark may be awarded.



Break up for Library Marks:

S.No	Attendance Range	Marks Awarded
1	10h and above	5
2	9h- less than 10h	4
3	8h - less than 9h	3
4	7h - less than 8h	2
5	6h - less than 7h	1

Note:

In exception, the utilization of e-resources of library will be considered.

*Components for "Skill Enhancement" may include the following:

Class Participation, Case Studies Presentation, Field Study, Field Survey, Group Discussion, Term Paper, Presentation of Papers in Conferences, Industry Visit, Book Review, Journal Review, e-content Creation, Model Preparation & Seminar.

Components for Skill Enhancement

Any one of the following should be selected by the course coordinator

S.No.	Skill Enhancement	Description
1	Class Participation	<ul style="list-style-type: none"> Engagement in class Listening Skills Behaviour
2	Case Study Presentation/ Term Paper	<ul style="list-style-type: none"> Identification of the problem Case Analysis Effective Solution using creativity/imagination
3	Field Study	<ul style="list-style-type: none"> Selection of Topic Demonstration of Topic Analysis & Conclusion
4	Field Survey	<ul style="list-style-type: none"> Chosen Problem Design and quality of survey Analysis of survey
5	Group Discussion	<ul style="list-style-type: none"> Communication skills Subject knowledge Attitude and way of presentation Confidence Listening Skill
6	Presentation of Papers in Conferences	<ul style="list-style-type: none"> Sponsored International/National Presentation Report Submission



7	Industry Visit	<ul style="list-style-type: none"> • Chosen Domain • Quality of the work • Analysis of the Report • Presentation
8	Book Review	<ul style="list-style-type: none"> • Content • Interpretation and Inferences of the text • Supporting Details • Presentation
9	Journal Review	<ul style="list-style-type: none"> • Analytical Thinking • Interpretation and Inferences • Exploring the perception if chosen genre • Presentation
10	e-content Creation	<ul style="list-style-type: none"> • Logo/ Tagline • Purpose • Content (Writing, designing and posting in Social Media) • Presentation
11	Model Preparation	<ul style="list-style-type: none"> • Theme/ Topic • Depth of background Knowledge • Creativity • Presentation
12	Seminar	<ul style="list-style-type: none"> • Knowledge and Content • Organization • Understanding • Presentation

ii) Distribution of External Marks

Total	:	50
Written Exam	:	50

Marks Distribution for Practical course

Total	:	100
Internal	:	50
External	:	50



i) Distribution of Internals Marks

S.No.	Particulars	Distribution of Marks
1	Experiments/ Exercises	15
2	Test 1	15
3	Test 2	15
4	Observation Notebook	05

Total 50

ii) Distribution of Externals Marks

S.No.	Particulars	External Marks
1	Materials and methods/ Procedures/ Aim	10
2	Experiment/ Performance/ Observations/ Algorithm	10
3	Results/ Calculations/ Spotters/ Output	10
4	Inference/Discussion/ Presentation	10
5	Record	6
6	Viva- voce	4

Total 50

A) Mark Distribution for Project/Internship/Industrial Training

Total : 100
Internal : 50
External : 50

i) Distribution of Internal Marks

S.No.	Particulars	Internal Marks
1	Review I	20
2	Review II	20
3	Attendance	10

Total 50



ii) Distribution of External Marks

S.No	Particulars	External Marks
1	Project Work/Internship/ Industrial training presentation	40
2	Viva -voce	10
Total		50

Evaluation of project Work/Internship/ Industrial training shall be done jointly by Internal and External Examiners

7. Credit Transfer

a. Upon successful completion of 1 NPTEL Course (4 Credit Course) recommended by the department, during Semester I to IV, a student shall be eligible to get exemption of one 4 credit course during the V or VI semester. The proposed NPTEL course should cover content/syllabus of exempted core paper in V or VI semester.

S. No.	Course Code	Course Name	Proposed NPTEL Course	Credit
1			Option – 1 Paper title	4
			Option – 2 Paper title	
			Option – 3 Paper title	

b. Upon successful completion of 2 NPTEL Courses (2 Credit each) recommended by the department, during Semester I to IV, a student shall be eligible to get exemption of one 4 credit course during the V or VI semester. Out of 2 NPTEL proposed courses, atleast 1 course should cover content/syllabus of exempted core paper in V or VI semester.

Mandatory

The exempted core paper in the V or VI semester should be submitted by the students for approval before the end of 4th semester.

Credit transfer will be decided by equivalence committee



S. No.	Course Code	Course Name	Proposed NPTEL Course	Credit
1			Option - 1 Paper title	2
			Option - 2 Paper title	
			Option - 3 Paper title	
2			Option - 1 Paper title	2
			Option - 2 Paper title	
			Option - 3 Paper title	

NPTEL Courses to be carried out during semester I - IV.					
S.No.	Student Name	Class	Proposed NPTEL Course		Proposed Course for Exemption
			Course I	Option 1- Paper Title Option 2- Paper Title Option 3- Paper Title	Any one Core Paper in V or VI Semester
			Course II	Option 1- Paper Title Option 2- Paper Title Option 3- Paper Title	

Upon Successful outcome of Design Thinking / Copy right/Product/ Patent by the end of the V Semester, student shall be eligible to get exemption in AECC: Innovation, IPR & Entrepreneurship / Innovation & IPR offered during VI Semester.

9. Internship/Industrial Training

Students must undertake industrial / institutional training for a minimum of 15 days during the IV semester summer vacation. The students shall submit the report for evaluation during V semester.

10. Extra Credits: 10

Earning extra credit is not essential for programme completion. Student is entitled to earn extra credit for achievement in Co-Curricular/ Extracurricular activities carried out other than the regular class hours.

A student is permitted to earn a maximum of Ten extra Credits during the programme period. A maximum of 1 credit under each category is permissible.



Category	Credit
Proficiency in foreign language	1
Proficiency in Hindi	1
Self study Course	1
Typewriting/Short hand	1
CA/ICSI/CMA (Foundations)	1
CA/ICSI/CMA (Inter)	1
Sports and Games	1
Publications / Conference Presentations (Oral/Poster)/Awards	1
Lab on Project	1
Innovation / Incubation / Patent / Sponsored Projects / Consultancy/	1
Representation in State / National level celebrations	1
Awards/ Recognitions / fellowships	1

Credit shall be awarded for achievements of the student during the period of study only.

GUIDELINES

Proficiency in foreign language

A pass in any foreign language in the examination conducted by an authorized agency.

Proficiency in Hindi

A pass in the Hindi examination conducted by Dakshin Bharat Hindi Prachar Sabha.

Examination passed during the programme period only will be considered for extra credit.

Self study Course

A pass in the self study courses offered by the department.

The candidate should register the self study course offered by the department only in the III semester.

Typewriting/Short hand

A Pass in short hand / typewriting examination conducted by Tamil Nadu Department of Technical Education (TNDTE) and the credit will be awarded.

CA/ICSI/CMA(Foundations)

Qualifying foundation in CA/ICSI/CMA / etc.



Sports and Games

The Student can earn extra credit based on their Achievement in sports in University/ State / National/ International.

Publications / Conference Presentations (Oral/Poster)

Research Publications in Journals

Oral/Poster presentation in Conference

Lab on Project (LoP)

To promote the undergraduate research among all the students, the LoP is introduced beyond their regular class hours. LoP is introduced as group project consisting of not more than five members. It consist of four stages namely Literature collection, Identification of Research area, Execution of research and Reporting / Publication of research reports/ product developments. These four stages spread over from III to V semester.

(Evaluation will be done internally)

Innovation/ Incubation/ Patent/ Sponsored Projects/ Consultancy

Development of model/ Products /Prototype /Process/App/Registration of Patents/ Copyrights/Trademarks/Sponsored Projects /Consultancy

Representation in State/ National level celebrations

State / National level celebrations such as Independence day, Republic day Parade, National Integration camp etc.

Awards/ Recognitions/fellowships

Regional/ State / National level awards/ Recognitions/Fellowships

100 % CIA Courses :

- AECC
- AECC

S.No	Type of Course
1	Environmental Studies (AECC)
2	Human Rights and Women's Rights, Basic Tamil / Advanced Tamil (AECC)
3	Innovation & IPR/ Innovation, IPR and Entrepreneurship (AECC)
4	Generic Elective (AECC)



Modalities for Implementing Internal Assessment Marks:

- Student pertaining to 2022 Batch (2022-25) UG programme for the above mentioned courses shall secure a minimum of 40% out of the maximum marks in the continuous internal assessment (CIA) i.e., 20 marks out of 50 marks.
- Students who have not acquired the minimum marks shall be allowed to reappear to improve their marks in the exam components only within the time duration of the programme, in the forthcoming semesters.

Distribution of Internal Marks for AECC & AECC (Theory)

S.No.	Particulars	Distribution of Marks
1	CIA I (2.5 Units) (On completion of 45 th working day)	15
2	Model (All 5 Units) (On completion of 85 th working day)	15
3	Assignment	05
4	Attendance	05
5	Library Usage	05
6	Skill Enhancement *	05

Total

50

Distribution of Internal Marks for Generic Elective (AECC) (Practical)

S.No.	Particulars	Distribution of Marks
1	CIA -I (1-5 Exercise)	5
2	CIA-II (6-10 Exercise)	5
3	Class Participation	10
4	Practical Record	10
5	Test-III & Viva -Voce(10+10)	20

Total

50



Question paper pattern AECC & AEEC

Test	MARKS	DESCRIPTION	TOTAL	Remarks
CIA Test I 1 Hour First 2.5 Units	50 x 1 = 50 Marks	MCQ	50 Marks	Marks secured will be Converted to 15 marks
CIA test II/ Model test 1 Hour All five Units	50 x 1 = 50 Marks	MCQ	50 Marks	Marks secured will be Converted to 15 marks

Question paper pattern		Total Marks - 50	
<u>Basic Tamil</u>		<u>Advanced Tamil</u>	
Section -A		Section -A	
Choose the correct answer	10x2=20	Choose the correct answer	10x1=10
Section -B		Section -B	
True or false	10x2=20	Fill in the blanks	10x2=20
Section -C		Section -C	
Answer in one page	1x10=10	Write an essay in two pages	2x10=20

Question paper pattern for all other courses falling under Part I to Part III

CIA Test : [1 ½ Hours-2.5 Units] - 25 Marks

SECTION	MARKS	DESCRIPTION	TOTAL	Remarks
Section – A	8 x 0.5 = 04 Mark	MCQ	25 Marks	Marks secured will be converte d to 15 marks
Section - B	3 x 3 = 09 Mark	Answer ALL Questions Either or Type ALL Questions Carry Equal Marks		
Section - C	2 x 6 = 12 Mark			



Model Test: [3 Hours-5 Units] - 50 Marks

SECTION	MARKS	DESCRIPTION	TOTAL	Remarks
Section - A	5 x 1 = 05 Marks	MCQ	50 Marks	Marks secured will be converted to 15 marks
Section - B	5 x 3 = 15 Marks	Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks		
Section - C	5 x 6 = 30 Marks			

End Semester Examination: [3 Hours-5 Units] - 50 Marks

SECTION	MARKS	DESCRIPTION	TOTAL
Section - A	5 x 1 = 05 Marks	MCQ	50 Marks
Section - B	5 x 3 = 15 Marks	Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks	
Section - C	5 x 6 = 30 Marks		



Course Code	Course Name	Category	L	T	P	Credit
221TL1A1TA	TAMIL- I: IKKALA ILAKKIYAM	LANGUAGE- I	4	1	-	03

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடு நாகரீகம், பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத் திறன்கள் (Life Skills)- மாணவர்களின் செயலாக்கத் திறனை ஊக்குவித்தல்	K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K4
CO3	பாட இணைச்செயல்பாடுகள் (Co-curricular activities)	K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input checked="" type="checkbox"/>	Intellectual Property Rights	<input checked="" type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221TL1A1TA	TAMIL- I: IKKALA ILAKKIYAM	SEMESTER I
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I மறுமலர்ச்சிக் கவிதைகள்

13 h

1. இலக்கிய வரலாறு - மறுமலர்ச்சிக் கவிஞர்களின் தமிழ்ப்பணிகள்
2. பாரததேசம் - பாரதியார்
3. படி - பாரதிதாசன்
4. தமிழரின் பெருமை - நாமக்கல் கவிஞர்
5. தமிழ்க் கொலை புரியாதீர் - புலவர் குழந்தை
6. திரைத்தமிழ்

அ) 'விஞ்ஞானத்த வளர்க்கப் போறண்டி' எனத் தொடங்கும்

பாடல் - உடுமலை நாராயண கவி

ஆ) 'சும்மா கிடந்த நிலத்தை' எனத் தொடங்கும் பாடல் -

பட்டுக்கோட்டை கல்யாண சுந்தரனார்

இ) 'சமரசம் உலாவும் இடமே' எனத் தொடங்கும் பாடல் - மருதகாசி

ஈ) 'உன்னை அறிந்தால்' எனத் தொடங்கும் பாடல் - கண்ணதாசன்

Unit II புதுக்கவிதைகள்

13 h

1. இலக்கிய வரலாறு - புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்
2. கடமையைச் செய் - மீரா
3. மலையாளக் காற்று - சிற்பி
4. ஒப்பிலாத சமுதாயம் - அப்துல் ரகுமான்
5. கன்னிமாடம் - மு.மேத்தா
6. கரிக்கிறது தாய்ப்பால் - ஆரூர் தமிழ்நாடன்
7. ஐந்தாம் வகுப்பு 'அ' பிரிவு - நா. முத்துக்குமார்
8. ஹைகூ கவிதைகள் - 10 கவிதைகள்

Unit III பெண்ணியம்

09 h

1. தொலைந்து போனேன் - தாமரை



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2. நீரில் அலையும் முகம் - அ. வெண்ணிலா
3. தற்காத்தல் - பொன்மணி வைரமுத்து
4. ஏனிந்த வித்தியாசங்கள் ? - மல்லிகா
5. புதையுண்ட வாழ்க்கை - சுகந்தி சுப்ரமணியன்

Unit IV சிறுகதைகள்

15 h

1. இலக்கிய வரலாறு - சிறுகதையின் தோற்றமும் வளர்ச்சியும்
2. கனகாம்பரம் - கு.ப.ராஜகோபாலன்
3. ஆற்றங்கரைப் பிள்ளையார் - புதுமைப்பித்தன்
4. பொம்மை - ஜெயகாந்தன்
5. காய்ச்சமரம் - கி. ராஜநாராயணன்
6. காட்டில் ஒருமான் - அம்பை
7. வேட்கை - சூர்யகாந்தன்

Unit V பயிற்சிப் பகுதி

10 h

அ. இலக்கணம்

1. வல்லின ஒற்று மிகும், மிகா இடங்கள் - ஒற்றுப்பிழை நீக்கி எழுதுதல்
2. ர,ற - ல,ழ,ள - ண,ந,ன வேறுபாடு - ஒலிப்பு நெறி, சொற்பொருள் வேறுபாடு அறிதல்)

ஆ. படைப்பாக்கம்

1. கவிதை - எழுதுதல் (15 வரிகள் முதல் 30 வரிகள் வரை)
2. சிறுகதை - எழுதுதல் (குறைந்தது 3 பக்கங்கள்)


Text Book

- 1 தமிழ் மொழிப்பாடம் - 2022-2023, தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர்-641048, வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை - 600 098.



References

- 1 பேராசிரியர் புலவர் சோம. இளவரசு, எட்டாம் பதிப்பு - 2014, தமிழ் இலக்கிய வரலாறு - மணிவாசகர் பதிப்பகம், சென்னை - 600 108.
- 2 பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு - 2013, இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன் - பூவேந்தன் பதிப்பகம், சென்னை-600 004.
- 3 இணையதள முகவரி: <https://www.tamilvu.org>

 Dr.N.G.P Arts and Science College		
APPROVED		
Pos- 6th	AC - 13th	GB - 18th
29.07.22	06.09.22	10.09.22



Course Code	Course Name	Category	L	T	P	Credit
221TL1A1HA	HINDI- I: MODERN LITERATURE	LANGUAGE-I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- The techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Apply the knowledge writing critical views on fiction	K3
CO4	Build creative ability	K3
CO5	Expose the power of creative reading	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input checked="" type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221TL1A1HA	HINDI- I: MODERN LITERATURE	SEMESTER I
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I	13 h
गद्य - नूतन गद्य संग्रह (जय प्रकाश) पाठ 1- रजियापाठ 2- मक्रीलपाठ 3- बहता पानी निर्मला पाठ 4- राष्ट्रपिता महात्मा गाँधी	
Unit II	13 h
कहानी कुंज- डॉ वी.पी. 'अमिताभ' (पाठ 1-4)	
Unit III	12 h
व्याकरण : शब्द विचार (संज्ञा, सर्वनाम, विशेषण)	
Unit IV	12 h
अनुच्छेद लेखन	
Unit V	10 h
अनुवाद अभ्यास-III (केवल अंग्रेजी से हिन्दी में) (पाठ 1 to 10)	

Text Books

- 1 प्रकाशक: सुमित्र प्रकाशन 204 लीला अपार्टमेंट्स, 15 हेस्टिंग्स रोड अशोक नगर इलाहाबाद-211001
- 2 प्रकाशक: गोविन्द प्रकाशन सदर बाजार, मथुरा उत्तरप्रदेश-281001
- 3 पुस्तक: व्याकरण प्रदिप - रामदेव प्रकाशक: हिन्दी भवन 36 टेगोर नगर इलाहाबाद-211024
- 4 पुस्तक: व्याकरण प्रदिप - रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024
- 5 प्रकाशक: दक्षिण भारत प्रचार सभा चेन्नई -17



Course Code	Course Name	Category	L	T	P	Credit
221TL1A1MA	MALAYALAM- I: MODERN LITERATURE	LANGUAGE-I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories.	K1
CO2	Understand the principles of translation work.	K2
CO3	Apply the knowledge writing critical views on fiction.	K3
CO4	Build creative ability.	K3
CO5	Expose the power of creative reading	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input checked="" type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221TL1A1MA	MALAYALAM- I: MODERN LITERATURE	SEMESTER I
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

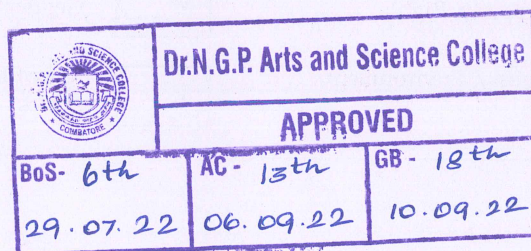
Unit I	Novel	14 h
	Pathummayude Adu	
Unit II	Novel	10 h
	Pathummayude Adu	
Unit III	Short Story	14 h
	Nalinakanthi	
Unit IV	Short Story	10 h
	Nalinakanthi	
Unit V	Practical Application	12 h
	Expansion of ideas, General Essay and Translation	

Text Books

- 1 Vaikkam Muhammed Basheer, "Pathummayude Adu" (NOVEL), DC Books & Kottayam
- 2 T.Padmanabhan, "Nalinakanthi" (Short Story), DC Books & Kottayam.

References

- 1 Malayala Novel Sahithyam.
- 2 Malayala Cherukatha Innale Innu.



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A1FA	FRENCH- I: GRAMMAR, TRANSLATION AND CIVILIZATION	LANGUAGE - I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written – Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Evaluate the Plural, Articles and the Hobbies	K3
CO4	Measure the Cultural Activity in France	K3
CO5	Select the sentiments, life style of the French people and the usage of the conditional tense	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input checked="" type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221TL1A1FA	FRENCH- I: GRAMMAR, TRANSLATION AND CIVILIZATION	SEMESTER I
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Salut I Page 10

12 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
<ul style="list-style-type: none"> • Saluer • Enter en contact avec quelqu'un. • Se présenter. • S'excuser 	En cours de cuisine, premiers contacts avec les membres d'un groupe	<ul style="list-style-type: none"> • Comprendre des personnes qui se saluent. • Échanger pour entrer en contact, se présenter, saluer, s'excuser. • Communiquer avec <i>tu</i> ou <i>vous</i>. • Comprendre les consignes de classe • Épeler son nom et son prénom. <p>Computer jusqu'à 10.</p>

Unit II Enchanté I Page 20

12 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
<ul style="list-style-type: none"> • Demander de se présenter. • Présenter quelqu'un. 	Dans la classe de français, se présenter et remplir une fiche pour le professeur.	<ul style="list-style-type: none"> • Comprendre les informations essentielles dans un échange en milieu professionnel. • Échanger pour se présenter et présenter quelqu'un.

Unit III J'adore I Page 30

12 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
<ul style="list-style-type: none"> • Exprimer ses goûts. 	Dans un café, participer à une soirée de rencontres rapides et remplir de taches d'appréciation.	<ul style="list-style-type: none"> • Dans une soirée de rencontres rapid comprendre des personnes qui échangent sur elles et sur leurs goût • Comprendre une personne qui parler des goûts de quelqu'un d'autre.



Unit IV J'adore I Page 30

14 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
<ul style="list-style-type: none"> Présenter quelqu'un 	Dans un café, participer à une soirée de rencontres rapides et remplir de tâches d'appréciation	<ul style="list-style-type: none"> Exprimer ses goûts. Comprendre une demande laissée sur un répondeur téléphonique. Parler de ses projets de week-end.
Autoévaluation du module I Page 40 – Préparation au DELF A1 page 42		
Demander à quelqu'un de faire quelque chose. Demander poliment. Parler d'actions passées. Tu veux bien?	Organiser un programme d'activités pour accueillir une personne importante.	Comprendre une personne demande un service à quelqu'un. Demander à quelqu'un de faire quelque chose. Imaginer et raconter au passé à partir de situations dessinées.

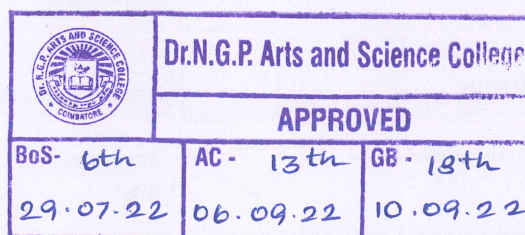
Unit V Practical Application

10 h

Make in Own Sentences

Text Book

- 1 Regine Merieux, Yves Loiseau, "LATITUDES - 1" (Page No: 9-55) (Methode de Français), Goyal Publisher & Distributors Pvt.Ltd., 86 UB Jawahar Nagar (Kamala Nagar), Delhi-7 Les Editions Dider, Paris, 2008- Imprime en Roumanie par Canale en Janvier 2012.



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221EL1A1EA	PROFESSIONAL ENGLISH- I	LANGUAGE- II	4	-	1	3

PREAMBLE

This course has been designed for students to learn and understand

- the effect of dialogue, the brilliance of imagery and the magnificence of varied genres
- any spontaneous spoken discourse and respond to them with proper sentence structure
- the transactional concept of English language

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the various aspects in poetry	K2
CO2	Infer linguistic and non-linguistic features of the context for understanding and interpreting	K3
CO3	Construct sentences and convey messages effectively in real life situations	K3
CO4	Apply different reading strategies with varying speed	K3
CO5	Prepare modules with their own ideas and present them coherently in a grammatically correct form	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2		✓			✓
CO3	✓	✓		✓	
CO4			✓		
CO5	✓	✓			✓

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221EL1A1EA	PROFESSIONAL ENGLISH- I	SEMESTER I
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Genre Studies 12 h

Nissim Ezekiel: The Worm- Author's Biography- title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques- Annotations

Niyi Osundare: Our Earth Will Not Die- Author's Biography- title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques- Annotations

A. G. Gardiner: On Superstitions- Author's biography- Narrative structure- Exploration of the text- passage analysis- insight of ideas- cohesion and context- style- language techniques- Annotations

Nancy Bella: Clever Thief- Author's Biography- Plot Summary- Detailed summary and Analysis- Themes- Important Quotations- Characters- Description - analysis- Terms- Symbols- Critical analysis

H. G. Wells: The Truth about Pyecraft- Author's Biography- narrative structure- passage analysis- insight of ideas- cohesion and context- style- language techniques

Unit II Listening Skills 12 h

Listening vs. hearing- Types of listening, Tips to enhance Listening Skills, Non-verbal and Verbal signs of active listening - Comprehensive Listening - Listening to pre-recorded audios on speeches, interviews and conversations - Listening Activities- Listening and responding to complaints (formal situation), Listening to problems and offering solutions (informal)

Unit III Speaking Skills 14 h

Formal occasions- Introducing oneself, Introducing others, Enquiries and Seeking permission, Making short presentations - Informal occasions- Requests, Offering help, Congratulating, Farewell party, graduation speech - Giving instructions to do a task and to use a device, Giving and asking directions



Unit IV Reading Skills

10 h

Study Skills: Skimming and Scanning- Reading different kinds of texts- Types of reading-Developing a good reading speed, reading aloud, Referencing skill - Word Power (Denotation and Connotation) - Reading comprehension, Data interpretation -Charts, Graphs, Advertisements

Unit V Writing Skills

12 h

Sentence patterns, Note- making and note taking-Strategies - Paragraph writing: Structure and Principles - Academic Writing - Formal and Informal Letters, Report, Book /Movie Review


Text Books

- 1 Gardiner, A. G. 1926. Alpha of the Plough: Second series, J.M. Dent & Sons Ltd., London, United Kingdom. pg.no-151-156. (Unit I)
- 2 Ezekiel, Nissim. "The Worm," Crazy Romantic Love, www.mianmawaisarain.live/2020/05/poem-worm-nissim-ezekiel.html. Accessed 3 Aug. 2022. (Unit I)
- 3 <<http://livros01.livrosgratis.com.br/ln000835.pdf/>>(Unit I)
- 4 Mithra,S.M. 1919. Hindu Tales from the Sanskrit, Macmillan & Co Ltd., London, United Kingdom. pg.no-127-142. (Unit I)
- 5 Nation, I. S. P and Jonathan Newton. 2009. Teaching ESL/EFLListening and Speaking. Routledge, New York, United States. (Unit II)
- 6 Prabha, Dr. R. Vithya & S. Nithya Devi. 2019. Sparkle. (1st Edn.) McGraw - Hill Education, Chennai, India. (Unit III- V)



References

- 1 Our Earth Will Not Die By NiyiOsundare." Studocu.Com, studocu.com/in/document/bangalore-university/bachelor-of-computer-applications/1586771577-our-earth-will-not-die/27675462. Accessed 3 Aug. 2022.
- 2 OnSuperstitions."THEHISTORIAN,thehistorian1947.wordpress.com/2019/03/08/on-superstitions-by-a-g-gardiner. Accessed 3 Aug. 2022.
- 3 Swales, John M. & Feak, Christine B. 2012. Academic Writing for Graduate Students: Essential Tasks and Skills, University of Michigan Press, Michigan.
- 4 Rudzka, Brygida -Ostyn, 2003. Word Power: Phrasal Verbs and Compounds: A Cognitive Approach, Mouton de Gruyter, New York, United States.

		
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BoS- 6 th	AC- 13 th	GB-18 th
29.07.22	06.09.22	10.09.22



Course Code	Course Name	Category	L	T	P	Credit
224AI1A1CA	PROBLEM SOLVING AND PROGRAMMING IN C	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental aspects of programming and problem solving
- The C language fundamentals
- The representation and working of arrays, pointers, functions and files

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Illustrate the basic principles of programming and problem solving	K2
CO2	Understand the fundamentals of C Language	K2
CO3	Implement decision making using branching and looping.	K3
CO4	Develop programs using arrays and functions	K3
CO5	Execute programs using pointers, structures and files	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓		
CO2	✓		✓		
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



224AI1A1CA	PROBLEM SOLVING AND PROGRAMMING IN C	SEMESTER I
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Programming and Problem Solving 12 h

Introduction: Types of Programming Languages - High level Languages - Assembly Languages - Machine Level Languages - System Software - Operating Systems - Compiler - Linker and Interpreter. Problem Solving Strategies: Steps involved in problem solving - Algorithms - Flow Charts - Symbols used in Flow Charts - Pseudo Codes - Structured Programming - Sequence - Selection - Repetition - Modular Programming.

Unit II C Language Fundamentals 12 h

Language Fundamentals: Introduction to C - Basic Structure of C Program - Constants - Variables - Data Types - Operators - Expressions - Evaluation of Expressions - Operator Precedence and Associativity - Managing the Input and Output - Formatted I/O - Unformatted I/O - Storage classes- Simple programs for logic building.

Unit III Decision Making and Arrays 12 h

Branching: Simple if Statement - if-else statement - elseif Ladder - Switch statement - goto, break and continue statements. Looping: while loop - do-while loop -for loop- nested for loop - Pre-processor Directives: Macro substitution - File inclusion - Compiler control directives. Arrays: Introduction - Types of arrays - Declaration and Initialization of Arrays - Dynamic Arrays.

Unit IV Strings, Functions and Pointers 12 h

Strings: Declaring and Initializing the string variables - String handling functions. Functions - Need for functions - Elements of functions - Category of functions - Passing arrays to functions - Recursion. Pointers: Understanding Pointers - Declaration and Initialization of pointer variables - Accessing variables through pointers - Pointers and arrays.



Unit V Structures and Files

12 h


Structures: Defining a structure - Declaring structure variables - Accessing structure member - Array of structures - Structure within structures - Unions. Files: Defining and opening a File - Closing a file - I/O Operations on files - Dynamic memory allocation - Command Line Arguments.

Text Books

- 1 Ashok N. Kamthane, 2009, "Programming and Data Structures", 1st Edition, Pearson Education.
- 2 Byron Gottfried, 2018, "Schaum's Outline of Programming with C", 4th Edition, McGraw Hill Education.

References

- 1 E.Balagurusamy, 2017, "Programming in ANSI C", 7th Edition TMH.
- 2 H. Schildt, 2000, "C: The Complete Reference", 4th Edition, TMH.
- 3 ReemaThareja , 2015, "Programming in C", 2nd Edition, Oxford University Press.
- 4 Anita Goel, Ajay Mittal, 2016, "Computer Fundamentals and Programming in C", 1st Edition, Pearson.

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224DA1A1CP	CORE PRACTICAL : C PROGRAMMING	SEMESTER I
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Total Credits: 2

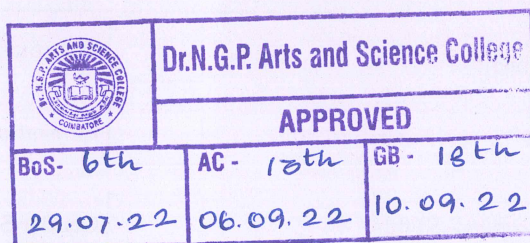
Total Instructions Hours: 48h

S.No

List of Programs

- 1 Simple Program to understand the concepts of data types
- 2 Program to get familiarity on using conditional statements
- 3 Program to implement patterns
- 4 Program to perform matrix and Dynamic Array operations
- 5 Program to Work with pointers
- 6 Program to implement functions
- 7 Program to perform recursion
- 8 Program to create and implement String manipulation
- 9 Program to test dynamic Memory Allocations
- 10 Program to implement structures
- 11 Program to perform union and enumerated Data types
- 12 Application Program using File operations

Note: Out of 12 programs 10 Mandatory



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
224IT1A1CA	DIGITAL COMPUTER FUNDAMENTALS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The concepts of number system and circuits
- The principles of logic gates and memory
- The design and architecture of microprocessors and microcontrollers

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the types of number systems, Boolean Algebra	K2
CO2	Understand and analyze Logic gates	K2
CO3	Illustrate the concepts of combinational circuits	K3
CO4	Understand the different types of sequential logic and memory organization	K2
CO5	Understand the architecture of microprocessors and microcontrollers	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓		
CO2	✓		✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224IT1A1CA	DIGITAL COMPUTER FUNDAMENTALS	SEMESTER I
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Binary Systems and Boolean Algebra 10 h

Binary Numbers- Number base conversions- Octal and Hexadecimal conversions- Complements- Binary codes - Decimal codes.

Basic Definitions-Boolean functions- Canonical standard forms: Minterms and Maxterms - Sum of Minterms-Product of Maxterms-conversion between canonical forms.

Unit II Logic Gates and Boolean functions 8 h

Digital Logic Gates: AND, OR, Inverter, Buffer, NAND, NOT, Exclusive-OR, Exclusive-NOR.

The Map method-Two and three-variable Maps-Four variable Map - Five and Six-Variable Maps- Product of Sum simplification - Don't care conditions.

Unit III Combinational Logic 10 h

Adders: Half-Adder, Full-Adder. Subtractors Half-Subtractor, Full-Subtractor. Multilevel NAND Circuits: Universal Gate. Multilevel NOR Circuits: Universal Gate. Binary Parallel Adder- Decimal Adder - BCD Adder. Decoders: Demultiplexers- Encoders - Multiplexer.

Unit IV Sequential Logic & Memory Unit 10 h

Introduction- Flip-flops-Clocked RS Flip-flop - D Flip-flop - JK Flip-flop - Design of Counters- Registers -Ripple Counters.

The Memory Unit - Random Access Memories: Integrated-circuit Memory- Magnetic-core Memory.

Unit V Introduction to Microprocessors and Microcontrollers 10 h

Introduction - Microprocessor- Microcomputer- Architecture of Microprocessors- History- Evolution- Microprocessor Applications- Evolution of Microcontrollers- Application of Microcontrollers. Architecture of 8085 Microprocessor- Pin diagram of 8085 Microprocessor.




Text Books

- 1 M.Morris Mano, 2019, "Digital Logic and Computer Design", Pearson India Education.
- 2 Soumitra Kumar Mandal, 2018, "Microprocessors and Microcontrollers - Architecture, Programming and Interfacing using 8085, 8086, 8051", 15th Edition, Tata Mc Graw Hill Education.

References

- 1 S. Salivahanan and S Arivazhagan, 2018, "Digital Circuits and Design", 5th Edition, Oxford University Press, Noida
- 2 Thomas Floyd L., 2015, "Digital Fundamentals", 11th Edition, Pearson Publication Ltd, New Delhi
- 3 M Morris Mano, 2016, " Digital Logic and Computer Design", 5th edition, Pearson
- 4 Aditya P Mathur, 2016, "Introduction to Microprocessor", 3rd Edition, McGraw Hill Education.

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BoS- 6 th	AC- 13 th	GB- 18 th
29.07.22	06.09.22	10.09.22



Course Code	Course Name	Category	L	T	P	Credit
222MT1A1ID	MATHEMATICS FOR COMPUTING-I	IDC	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the concepts of matrices and determinants
- the technique of obtaining eigen values and eigen vectors
- the method of solving linear system of equations

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	define the various terms of matrices and the operations involved in it	K1
CO2	identify the determinant value of matrices	K2
CO3	determine the eigen values and eigen vectors through different methods	K3
CO4	recognize the direct and indirect methods for solving algebraic equations	K1
CO5	discuss the method of solving differential and integral problems	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓		
CO5	✓	✓	✓		

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



222MT1A1ID	MATHEMATICS FOR COMPUTING-I	SEMESTER I
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Systems of Linear Equations 13 h

Introduction to system of linear equations- - linear systems in two and three unknown - augmented matrices and elementary row operations - Gaussian elimination- Matrices and Matrix operations - inverses - algebraic properties of matrices - elementary matrices - method for finding A^{-1} - invertible matrices - diagonal matrices - triangular matrices - symmetric matrices

Unit II Determinants 12 h

Introduction - determinants by cofactor expansion- minors and cofactors - technique for evaluating 2×2 and 3×3 determinants - evaluating determinants by row reduction - elementary row operations - Matrices with proportional rows or columns - properties of determinants - Cramer's rule.

Unit III Eigenvalues and Eigenvectors 10 h

Definition of eigenvalues and eigenvectors - computing eigenvalues and eigenvectors - Diagonalization - Geometric and Algebraic multiplicity - complex vector spaces - vectors in C^n - differential equations - first order linear systems - solution by diagonalization

Unit IV Solution of Algebraic , Transcendental and Linear Systems of Equations 13 h

Introduction - Newton-Raphson method-Direct methods -Matrix inversion method-Gaussian elimination method - Gauss Jordan method Iterative methods - Gauss Seidel Method - Gauss Jacobi method

Unit V Interpolation, Numerical Differentiation and Integration 12 h

Introduction - Finite differences - Newton's formulae for interpolation - Interpolation with unevenly spaced points: Lagrange's interpolation formula- Numerical differentiation - maximum and minimum values of a tabulated Function - Numerical integration - Trapezoidal rule - Simpson's 1/3 Rule - Simpson's 3/8 Rule.

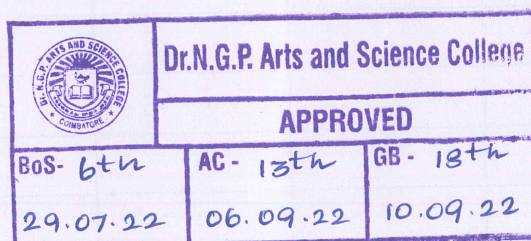


Text Books

- 1 Howard Anton and Chris Rorres, 2015 "Elementary Linear Algebra with Supplemental Applications", 11th Edition, Wiley India Pvt. Ltd, New Delhi. (Unit I to III)
- 2 Sastry, S.S, 2012, "Introductory methods of Numerical Analysis", Prentice-Hall of India. New Delhi. (Unit IV to V)

References

- 1 Partha Karmakar, Chandan Bikash Das, Pabitra kumar Gouri, 2021 "Introduction to Linear Algebra", 1st Edition, Books and Allied(P) Ltd, Kolkata
- 2 Gilbert Strang, 2005, "Linear Algebra and its Applications", 4th Edition, Brooks/Cole, Noida.
- 3 Veerarajan.T, Ramachandran.T, 2004, "Theory and Problems in Numerical Methods With Programs in C and C++", 10th Edition, Tata Mc- Graw Hill Publishing Company Limited, New Delhi.
- 4 Venkataraman,M.K. 2004, "Numerical Methods in Science and Engineering", 4th Edition, NPC



Course Code	Course Name	Category	L	T	P	Credit
223MB1A1AA	ENVIRONMENTAL STUDIES	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- Multi disciplinary aspects of Environmental studies
- Importance to conserve the Biodiversity
- Causes of Pollution and its control

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the importance of natural resources in order to conserve for the future.	K2
CO2	Infer on Natural resources and its conservation	K2
CO3	Apply the knowledge on Biodiversity and its conservation	K3
CO4	Relate effects, causes and control of air, water, soil and noise pollution etc.,	K2
CO5	Build awareness about sustainable development and Environmental protection	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

223MB1A1AA	ENVIRONMENTAL STUDIES	SEMESTER I
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Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Environmental studies & Ecosystems 5 h

Introduction to Environmental studies & Ecosystems: Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance; Concept of sustainability and sustainable development. Ecosystem- Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession.

Unit II Natural Resources: Renewable and Non-renewable Resources 5 h

Natural Resources: Renewable and Non-renewable Resources: Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and overexploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs.

Unit III Biodiversity and Conservation 5 h

Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit IV Environmental Pollution, Environmental Policies & Practices 5 h

Environmental Pollution, Environmental Policies & Practices: Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Prevention & Control of Pollution Act – Air & Water. Wildlife Protection Act; Forest Conservation Act;



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Unit V Human Communities and the Environment & Field Work 4 h

Human Communities and the Environment & Field Work: Human population and growth: Impacts on environment, human health and welfares. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness. Visit to an area to document environmental assets; river/forest/flora/fauna, etc. Population explosion – Family Welfare Programmes. Role of Information Technology in Environment and human health. Role of the Colleges, Teachers and Students in village adoption towards clean, green and make in villages in various aspects.


Text Books

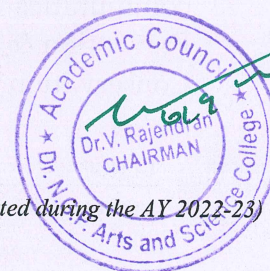
- 1 Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
- 2 Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.

References

- 1 Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge
- 2 Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press
- 3 Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006
- 4 Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
- 5 McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books
- 6 McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century
- 7 Odum, E.P., Odum, h.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.

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<i>B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)</i>		
29.07.22	06.09.22	10.09.22



Course Code	Course Name	Category	L	T	P	Credit
221TL1A2TA	TAMIL - II: ARA ILAKKIYAM	LANGUAGE- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம்,பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத்திறன்கள் (Life Skills) - மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K2
CO4	சூழலியல் ஆக்கம் (Ecology)	K3
CO5	மொழி அறிவு (Tamil knowledge)	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON

✓ Skill Development	✓ Entrepreneurial Development
✓ Employability	✓ Innovations
✓ Intellectual Property Rights	✓ Gender Sensitization
✓ Social Awareness/ Environment	✓ Constitutional Rights/ Human Values/ Ethics



221TL1A2TA	TAMIL - II: ARA ILAKKIYAM	SEMESTER II
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I அற இலக்கியம் 13 h

1. இலக்கிய வரலாறு- பதினென்கீழ்க்கணக்குநூல்கள்

2. திருக்குறள்

அ. அறன்வலியுறுத்தல்- அ. எண் 04

ஆ. நட்பாராய்தல் - அ. எண் 80

இ. நாடு- அ. எண் 74

ஈ. குறிப்பறிதல்- அ. எண் 110

Unit II அற இலக்கியம் 13 h

1. நாலடியார் - அறிவுடைமை

2. மூதுரை - ஓளவையார் - 10 பாடல்கள்-6,7,9,10,14,16,17,23,26,30

3. இனியவைநாற்பது- பூதஞ்சேந்தனார் - முதல் 10 பாடல்கள்

Unit III அறநெறிக் கட்டுரைகள் 09 h

1. இலக்கியவரலாறு - தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

2. கலைகள்-உ.வே.சா

3. சங்க நெறிகள்- வ.சுப.மாணிக்கம்

Unit IV அறநெறிக் கட்டுரைகள் 15 h

1. வீர வணக்கம் - க.கைலாசபதி

2. தமிழர் பண்பாடு - டாக்டர் சோ.நா.கந்தசாமி

3. இணையத் தமிழ் வளர்ச்சி - முனைவர் ப.அர.நக்கீரன்

Unit V பயிற்சிப் பகுதி 10 h

1. இலக்கணம்-வழு, வழுவமைதி, வழாநிலை

2. அலுவலகம் சார்ந்த கடிதம் - விண்ணப்பங்கள், வேண்டுகோள், முறையீடு

3. படைப்பாக்கம்-பொதுத்தலைப்பில் கட்டுரைகள் எழுதுதல்




Text Book

- 1 தமிழ் மொழிப்பாடம்-2022-2023,தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி,கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ்,சென்னை. (Unit I to V)

References

- 1 பேராசிரியர் புலவர் சோம. இளவரசு,எட்டாம் பதிப்பு-2014,தமிழ் இலக்கிய வரலாறு- மணிவாசகர் பதிப்பகம்,சென்னை.
- 2 பேராசிரியர் முனைவர் பாக்கியமேரி,முதற் பதிப்பு- 2013,இலக்கணம்- இலக்கிய வரலாறு- மொழித்திறன்- பூவேந்தன் பதிப்பகம்,சென்னை. .
- 3 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY
வலைதள முகவரி : <https://www.tamilvu.org>

		
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Course Code	Course Name	Category	L	T	P	Credit
221TL1A2HA	HINDI- II: MODERN LITERATURE	LANGUAGE- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- the techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Apply the knowledge writing critical views on fiction	K3
CO4	Build creative ability	K3
CO5	Expose the power of creative reading	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221TL1A2HA	HINDI - II: MODERN LITERATURE	SEMESTER II
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I 13 h

आधुनिक पद्य - शबरी (श्री नरेश मेहता)

Unit II 13 h

उपन्यास: सेवासदन-प्रेमचन्द

Unit III 12 h

कहानी-किरीट- डा उषा पाठक / डा अचला पाण्डेय

पाठ 1.कफ़न, 3. चीफ़ की दावत

Unit IV 12 h

पत्र लेखन: (औपचारिक या अनौपचारिक)

Unit V 10 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में) (पाठ 1 to 10)

Text Books

- 1 प्रकाशक: लोकभारती प्रकाशन पहली मंजिल, दरबारी बिल्डिंग, महात्मा गाँधी मार्ग, इलाहाबाद. (Unit I)
- 2 प्रकाशक: सुमित्र प्रकाशन 204 लीला अपार्टमेंट्स, 15 हेस्टिंग्स रोड' अशोक नगर इलाहाबाद. (Unit II)
- 3 प्रकाशक: राधाकृष्ण प्रकाशन दिल्ली. (Unit III)
- 4 पुस्तक: व्याकरण प्रदिप - रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद. (Unit IV)
- 5 प्रकाशक: दक्षिण भारत प्रचार सभा चेन्नई. (Unit V)

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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A2MA	MALAYALAM - II: MODERN LITERATURE	LANGUAGE -I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON

✓ Skill Development	✓ Entrepreneurial Development
✓ Employability	✓ Innovations
✓ Intellectual Property Rights	✓ Gender Sensitization
✓ Social Awareness/ Environment	✓ Constitutional Rights/ Human Values/ Ethics



221TL1A2MA	MALAYALAM- II: MODERN LITERATURE	SEMESTER II
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Novel 12 h

Enmakaje: Chapter1- Chapter5

Unit II Novel 10 h

Enmakaje: Chapter 6- Chapter 10

Unit III Novel 12 h

Enmakaje: Chapter 11- Chapter 15

Unit IV Autobiography 14 h

NeermathalamPoothaKalam :Chapter 1- Chapter 10

Unit V Autobiography 12 h


NeermathalamPootha Kalam: Chapter 11- Chapter 20

Text Books

- 1 Ambika SuthanMangad, Enmakaje (Novel), DC Books Kottayam, Kerala, India. (Unit I to III)
- 2 Madhavikkutty, NeermathalamPootha Kalam (Autobiography), DC Books Kottayam, Kerala, India. (Unit IV & V)

References

- 1 MalayalaNovel Sahithyam, DC Books Kottayam, Kerala, India.
- 2 MalayalaSahithyaCharithram, National Books Kottayam, Kerala, India.

		
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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A2FA	FRENCH- II: GRAMMAR, TRANSLATION AND CIVILIZATION	LANGUAGE- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written- Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Select the Plural, Articles and the Hobbies	K2
CO4	Measure the Cultural Activity in France	K3
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input checked="" type="checkbox"/>	Intellectual Property Rights	<input checked="" type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221TL1A2FA	FRENCH- II: GRAMMAR, TRANSLATION AND CIVILIZATION	SEMESTER II
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I

12 h

Proposer, accepter, refuser une invitation. Indiquer la date.	Organiser une soirée au cinéma avec des amis, par téléphone et par courriel.	Comprendre un message d'invitation sur un répondeur téléphonique. Inviter quelqu'un à accepter ou refuser l'invitation.
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Unit II

12 h

Prendre et fixer un rendez-vous. Demander et indiquer l'heure.	Organiser une soirée au cinéma avec des amis, par téléphone et par courriel.	Comprendre des personnes qui fixent un rendez-vous par téléphone. Prendre un rendez-vous par téléphone
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Unit III

12 h

Exprimer son point de vue positif et négatif. S'informer sur le prix. S'informer sur la quantité. Exprimer la quantité.	En groupes, choisir un cadeau pour un ami.	Exprimer son point de vue sur des idées de cadeau. Faire des achats dans un magasin
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Unit IV

14h

Demander et indiquer une direction. Localiser (près de, en face de). Exprimer l'obligation l'interdit. Conseiller.	Suivre un itinéraire à l'aide d'indications par téléphone et d'un plan. Par courrier électronique, donner des informations et des conseils à un ami qui veut voyager.	Comprendre des indications de direction. Comprendre des indications de lieu. Comprendre une chanson. Comprendre de courts messages qui expérimentent l'obligation ou l'interdiction. Donner des conseils à des personnes dans des situations données.


Unit V

10 h

Make in Own Sentences

Text Book

- 1 Regine Merieux, Yves Loiseau, "LATITUDES - 1" (Page No: 56-101) (Méthode de Français), Goyal Publisher & Distributors Pvt.Ltd., 86 UB Jawahar Nagar (Kamala Nagar), New Delhi-7 Les Editions Dider, Paris, 2008- Imprimé en Roumanie par Canale en Janvier 2012. (Unit I to IV)

		
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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221EL1A2EA	PROFESSIONAL ENGLISH - II	LANGUAGE- II	4	-	1	3

PREAMBLE

This course has been designed for students to learn and understand

- the language for specific purposes through various literary manuscripts
- the process of communicative competences in academics through authentic contexts
- the different formats of business correspondence with lucidity and accuracy via various media

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn to appreciate the works of eminent writers from various genres	K1
CO2	Construct and comprehend complex situational talks	K3
CO3	Identify formal and informal communicative context to speak fluently	K3
CO4	Infer the denotative and connotative meanings while reading specialized texts	K2
CO5	Develop the skill of writing through descriptions, narrations and essays	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221EL1A2EA	PROFESSIONAL ENGLISH - II	SEMESTER II
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Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I Genre Studies 12 h

John Keats: La Belle Dame Sans Merci - Author's Note - title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques- Annotations

A. G. Gardiner: On Keyhole Morals- Author's Note- Title indications- Outline - Passage Analysis - context of the Prose - Narrative techniques- Style

Charles Lamb: A Dissertation upon Roast Pig- Author's Note - title indications- outline- paraphrasing the Essay- context of Essay- form- devices- Narrative techniques

John Galsworthy: The Silver Box - Author's Note- Plot Summary- Critical Analysis- Themes- Characters- Description - analysis- Terms- Symbols

Unit II Listening Skills 10 h

Listening to Talks/Lectures by Specialists on selected subject specific topics- Listening to Public Announcements- Listening to Instructions & Directions- Listening to Speeches- Listening to process/event descriptions to identify cause & effects

Unit III Speaking Skills 14 h

Small Talk- Mini Presentations and Making Recommendations- Group Discussions, Debates, and Expressing opinions through Role play- Picture Description- Giving Instruction to Use a Product- Presenting a Product- Summarizing a Lecture- Narrating Personal Experiences/ Events- Interviewing a Celebrity- Scientific Lectures- Educational Videos- Debates- Different Viewpoints on an Issue

Unit IV Reading Skills 12 h

Reading Biographies, Newspaper Reports, Technical Blogs- Reading Advertisements- Gadget Reviews - Newspaper Articles- Journal Reports- Reading Editorials & Blogs- Case Studies- Excerpts from Literary Texts.



Unit V Writing Skills

12 h

Inferring & Interpreting- Predicting Reorganizing Material- Summary Writing Based on the Reading Passages- Writing - Emails & Essay Writing (Descriptive or narrative)- Grammar - Tenses- Question Types: Wh/ Yes or No/ and Tags.

Text Books


- 1 <<https://www.poetryfoundation.org/poems/44475/la-belle-dame-sans-merci-a-ballad/>> (Unit I)
- 2 <<https://sittingbee.com/on-keyhole-morals-a-g-gardiner/>> (Unit I)
- 3 <<https://www.gradesaver.com/charles-lamb-essays/study-guide/summary-a-dissertation-upon-roast-pig/>> (Unit I)
- 4 <<https://public-library.uk/ebooks/41/61.pdf>> The Silver Box- John Galsworthy/> (Unit I)
- 5 Hart, Steve, Aravind R. Nair, Veena Bhambhani. 2016. Embark: English for Undergraduates. Cambridge University Press, New Delhi, India. (Unit II)
- 6 Lakshminarayanan. 2012. A Course Book On Technical English. Scitech Publications Pvt. Ltd, New Delhi, India. (Unit III)
- 7 Raman, Meenakshi & Sangeeta Sharma. 2016. Technical Communication- Principles And Practice, Oxford University Press, New Delhi, India. (Unit IV)
- 8 Viswamohan, Aysha. 2017. English For Technical Communication (With CD), McGraw Hill (India) Private Limited, New Delhi, India. (Unit V)

References

- 1 Bajwa and Kaushik. 2010. Springboard to Success- Workbook for Developing English and Employability Skills. Orient Black Swan, Chennai, India.
- 2 Chellammal, V. 2003. Learning to Communicate. Allied Publishing House, New Delhi, India.
- 3 Krishnaswamy, N, Lalitha Krishnaswamy & B.S. Valke. 2015. Eco English, Learning English through Environment Issues. An Integrated, Interactive Anthology. Bloomsbury Publications, New Delhi, India.
- 4 Syamala. V. 2002. Effective English Communication for You. Emerald Publishers, Chennai, Tamil Nadu, India.



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(Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
224CA1A2CA	DATA STRUCTURES	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Fundamental concept of data structure with effective utilization of space and time
- Linear and nonlinear data structures
- Different Searching, Sorting and Hashing techniques

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of data structures and algorithmic complexity	K2
CO2	Demonstrate the operations of Stack and Queue and their applications	K2
CO3	Implement operations on linked list and its variants	K3
CO4	Apply non linear data structures such as trees and graphs in problem solving	K3
CO5	Analyze the various sorting, searching algorithms and hashing techniques	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓		
CO4	✓	✓	✓		
CO5	✓	✓	✓		

COURSE FOCUS ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



224CA1A2CA	DATA STRUCTURES	SEMESTER II
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Data Structures and Arrays 10 h

Introduction: Basic Terminology -Classification of Data Structures -Operations on Data Structures-Abstract Data Type-Algorithms-Time and Space Complexity -Big O Notation-Omega Notation (Ω) -Theta Notation (Θ). Arrays: Declaration of Arrays- Accessing the elements of an array-Storing values in Arrays-Operations on Arrays. Applications of Arrays: Sparse Matrices

Unit II Stacks and Queues 12 h

Stacks: Array Representation of Stacks- Operations on a Stack-Linked Representation of Stacks. Applications of Stacks: Evaluation of Arithmetic Expressions -Recursion. Queues: Array Representation of Queues - Operations on Queues -Linked Representation of Queues - Circular Queues. Applications of Queues: JOB Scheduling

Unit III Linked Lists 12 h

Singly Linked Lists: Inserting a node in a Linked List- Deleting a node from a Linked List. Circular Linked Lists: Inserting a node in a Circular Linked List - Deleting a node from a Circular Linked List. Doubly Linked Lists: Inserting a node in a Doubly Linked List - Deleting a node from a Doubly Linked List. Applications of Linked Lists: Polynomial Addition

Unit IV Trees and Graphs 14 h

Trees: Binary Trees - Representation of Binary Trees -Creating a Binary Tree - Traversing a Binary Tree- Binary Search Trees and its Operations - Threaded Binary Trees. Applications of Trees: Expression Trees. Graphs: Graph Terminology - Representation of Graphs - Graph Traversal Algorithms.Applications of Graphs: Shortest Path Algorithm : Dijkstra's Algorithm. Minimum Spanning Trees : Prim's Algorithm

Unit V Searching , Sorting and Hashing 12 h

Searching: Linear search -Binary Search. Sorting: Bubble Sort - Insertion Sort - Selection Sort - Quick Sort-Merge Sort -Heap Sort. Hashing and Collision: Hash Tables - Hash Functions - Collision. Applications of Hashing: Keyword Table in a Compiler.




Text Books

- 1 Reema Thareja, 2018, "Data Structures using C", Second Edition, Oxford University Press.
- 2 G A V Pai, 2017, "Data Structures and Algorithms: Concepts - Techniques and Applications", McGraw Hill Education.

References

- 1 Mark Allen Weiss, 2014, "Data Structures and Algorithm Analysis in C++", Third Edition, Pearson education.
- 2 Yashavant Kanetkar, 2003, "Data Structure Through C++ Paperback", 4th Edition, BPB Publications.
- 3 Lipchitz (Schaum's Outline Series), 2010, "Data Structures with C", McGraw Hill Education.
- 4 https://www.tutorialspoint.com/data_structures_algorithms/index.htm

		
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Course Code	Course Name	Category	L	T	P	Credit
224CS1A2CA	OBJECT ORIENTED PROGRAMMING WITH C++	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The object oriented programming principles.
- The structure and features of C++.
- The design and implementation of OOPs concepts using C++.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the concepts of object oriented programming and basic constructs of C++ programming	K1
CO2	Design simple applications using classes and objects	K2
CO3	Illustrate the concept of Inheritance and apply pointers and strings	K3
CO4	Apply polymorphism and exception handling in program design	K3
CO5	Implement programs using File Management and STL	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓		
CO4	✓	✓	✓		
CO5	✓	✓	✓		

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



224CS1A2CA	OBJECT ORIENTED PROGRAMMING WITH C++	SEMESTER II
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Object Oriented Programming 10 h

Introduction - Programming Paradigms - Key concepts of Object-Oriented Programming - Applications of Object-Oriented Programming - Variable, Value and Constant - Components of a C++ Program - Data Types - Expressions - Type Conversion - Order of Evaluation - Formatting Data: Manipulators in Input/Output- Branching and Looping.

Unit II Classes and Arrays 10 h

User-Defined Types: Classes-Class Definition-Member function- Access Modifiers- Inline function- Constructors and Destructors- Instance Members: Instance Data Members-Instance Member Functions -Static Members - Arrays: One-Dimensional Arrays - Multidimensional Arrays. Case Study: Wave Array

Unit III Pointers, Strings and Inheritance 10 h

References - Pointers - Pointer Types and Pointer variables - Constant Modifiers - Pointer to Pointer- Arrays and Pointers - Strings: C ++ String Class -C++ String Library - Inheritance: Private, Public and Protected Inheritance - Association - Dependency

Unit IV Polymorphism and Exception Handling 10 h

Polymorphism- Binding- Abstract Class : Pure Virtual Functions - Multiple Inheritance - Overloading Principles - Overloading as Member- Nonmember: Friend function-Exception Handling : Approach- Exceptions in Classes - Standard Exception Classes - Templates: Function Template - Class Template.

Unit V File Handling and Standard Template Library 8 h

Input and Output stream - Stream Classes - Console Streams - Console Objects - Stream State - File Streams - File I/O - Opening Modes - Sequential Vs Random Access - String Streams - Formatting Data: Direct use of Flags, Fields and Variables - Predefined Manipulators-Standard Template Library: Iterators, Sequence Containers, Container Adapters.



Text Books

- 1 Ashok Kamthane, 2017, "Object-Oriented Programming with ANSI and Turbo C++", 3rd Edition, Pearson.
- 2 Behrouz A. Forouzan, Richard F. Gilberg, 2020, "C++ Programming: An Object-Oriented Approach", McGraw-Hill Education.

References

- 1 Bjarne Stroustrup, 2022, "C++ Programming Language", Fourth Edition, Pearson.
- 2 E Balagurusamy, 2020, "Object-Oriented Programming with C++", 8th Edition, McGraw Hill Education
- 3 M. Ashwin, V. Sreeprada, M. Santhosh, 2022, "A Hand Book on C++ Programming", Notion Press
- 4 Yashavant Kanetkar, 2020, "Let Us C++", BPB Publications.
- 5 <https://www.codecademy.com/>
- 6 <https://www.simplilearn.com/>

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224DA1A2CP	CORE PRACTICAL: DATA STRUCTURES AND C++	SEMESTER II
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Total Credits: 2

Total Instructions Hours: 48 h

S.No	Contents
1	Program for implementing classes and objects
2	Program for implementing constructors and destructors
3	Program for implementing inheritance
4	Program to perform exception handling
5	Program to implement overloading
6	Program to implement virtual functions
7	Program to perform Push, Pop, Display operations in Stack
8	Program to convert infix expression to postfix expression using Stack
9	Program to perform insertion, deletion and display in Queue
10	Program to perform Linked list operations
11	Program to perform Searching
12	Program to implement Sorting

Note: Out of 12 programs 10 are mandatory

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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
222MT1A2ID	MATHEMATICS FOR COMPUTING- II	IDC	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the concepts of probability theory and distribution
- the method of finding the moments of a random variable
- the method of checking the validity of parameters through test statistic

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	State the basic concepts of probability theory	K1
CO2	Discuss the concept of discrete and continuous distribution	K2
CO3	Define the parameters of central tendencies and dispersion.	K2
CO4	Demonstrate the applications of correlation and regression	K3
CO5	Analyze the validity of the values of parameters through hypothesis testing	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



222MT1A2ID	MATHEMATICS FOR COMPUTING- II	SEMESTER II
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Elementary probability and Random variable 11 h

Random experiment - De-Morgan's laws - conditional probability - generalization of multiplicative law - Bayes' probabilities - random variable - discrete and continuous random variable - distribution function - discrete probability distribution and function - mathematical expectation - moments - moment generating function - characteristic function - cumulants.

Unit II Probability Distribution 12 h

Binomial distribution - Bernoulli's theorem - Poisson distribution and Poisson variate X - relationship between the probabilities, $P(X=x)$ and $P(X=x+1)$ - Hypergeometric distribution - Normal and Lognormal distribution - Beta, Gamma and Exponential distribution - Weibull distribution

Unit III Measures of Central tendency and Dispersion 13 h

Characteristics of a good measure of central tendency - mean - arithmetic Mean - pooled mean - geometric Mean - harmonic mean - median - mode.

Measures of dispersion - purposes - properties - range - interquartile range - mean deviation - variance - standard deviation - coefficient of variation.

Unit IV Correlation and Regression 12 h

Scatter diagram - least square method - properties - regression line of X on Y - regression coefficient from coded data - correlation methods - graphical method - correlation coefficient - correlation in grouped bivariate data - relationship between correlation coefficients and regression coefficients - rank correlation.

Unit V Test of Significance and t- Test 12 h

Types of hypothesis - two types of errors - level of significance - critical region - one and two tailed test - size and power of a test - randomized test - non randomized test - degrees of freedom - student's t- test - test of equality of two population means - paired t- test - interval estimation - large sample tests - tests of hypothesis for proportions.

Note: Distribution of marks 80% Problem and 20% Theory.




Text Books

- 1 Agarwal B. L, 2013, "Basic Statistics", 6th Edition, New age International (P) Limited publishers, New Delhi.

References

- 1 Gupta C.B and Vijay Gupta, 2007, "An Introduction to Statistical Methods", 23rd Edition, S.Chand & Co, New Delhi.
- 2 Sanchetti, D.C. Kapoor, V.K, 2010 "Statistics", 7th Edition, S.Chand & Co, New Delhi.
- 3 Veerarajan. T, 2017, "Fundamentals of Mathematical Statistics", 1st Edition, Yes Dee Publishing Pvt Ltd, Chennai.
- 4 SivaramakrishnaDas.P, Vijayakumar.C, 2020, "Probability and Statistics", 2nd Edition, Pearson Education, Noida.

		
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221TL1A2AA	PART-IV : BASIC TAMIL	SEMESTER II
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Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

இளங்கலை 2022 – 23ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது
(10 மற்றும் 12 – ஆம் வகுப்பு வரை தமிழ் மொழிப்பாடம் பயிலாதவர்களுக்கு)

(பருவத் தேர்வு இல்லை)

Syllabus

- Unit I** தமிழ் மொழியின் அடிப்படைக் கூறுகள் 05 h
எழுத்துகள் அறிமுகம்
1. உயிர் எழுத்துக்கள் - குறில் , நெடில் எழுத்துகள்
2. மெய் எழுத்துக்கள் - வல்லினம், மெல்லினம், இடையினம்
3. உயிர்மெய் எழுத்துக்கள்
4. பயிற்சி
- Unit II** சொற்களின் அறிமுகம் 05 h
1.பெயர்ச்சொல்
2.வினைச்சொல் – விளக்கம் (எ.கா.)
3.பயிற்சி
- Unit III** குறிப்பு எழுதுதல் 05 h
1. பெயர், முகவரி, பாடப்பிரிவு , கல்லூரியின் முகவரி
2. தமிழ் மாதங்கள்(12), வாரநாட்கள்(7)
3. எண்கள் (ஒன்று முதல் பத்து வரை), வடிவங்கள், வண்ணங்கள்
- Unit IV** குறிப்பு எழுதுதல் 05 h
1. ஊர்வன, பறப்பன, விலங்குகள்
2. மனிதர்களின் உறவுப்பெயர்கள்
3. ஊர்களின் பெயர்கள் (எண்ணிக்கை 10)



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Unit V பயிற்சிப் பகுதி

04 h

பயிற்சிப் பகுதி (உரையாடும் இடங்கள்)

வகுப்பறை, பேருந்து நிலையம், சந்தை - பேசுதல், எழுதுதல்.

Notes:

அக மதிப்பீட்டுத் தேர்வு - வினாத்தாள் அமைப்பு முறை
பகுதி - அ

மொத்த மதிப்பெண்கள் - 50

சரியான விடையைத் தேர்வு செய்தல்

10x2=20

பகுதி - ஆ

சரியா? தவறா?

10x2=20

பகுதி - இ

ஒரு பக்க அளவில் விடையளிக்க

1x10=10

குறிப்பு:


- அனைத்து அலகுகளில் இருந்தும் வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ -க்கான வினாக்கள் இது அல்லது அது என்ற அடிப்படையில் அமைதல் வேண்டும்

Text Book

- 1 அடிப்படைத் தமிழ் - 2022-2023, தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர் - 641048, வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை. (Unit I to IV)

References

- 1 ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம், சென்னை.
- 2 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY
வலைதள முகவரி : <https://www.tamilvu.org>.

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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

221TL1A2AB	PART - IV : ADVANCED TAMIL	SEMESTER II
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Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2022- 2023 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது
(10 மற்றும் 12 - ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது)
(பருவத் தேர்வு இல்லை)
Syllabus

Unit I	கவிதைகள்	06 h
1. தமிழ்நாடு	- பாரதியார்	
2. மனதில் உறுதி வேண்டும்	- பாரதியார்	
3. இன்பத்தமிழ்	- பாரதிதாசன்	
4. வேலைகளல்ல வேள்விகள்	- தாராபாரதி	
5. தமிழா! நீ பேசுவது தமிழா!	- காசியானந்தன்	
6. நட்புக் காலம் (10 கவிதைகள்)	- அறிவுமதி கவிதைகள்	
Unit II	கட்டுரை	05 h
கட்டுரைத் தொகுப்பு - நல்வாழ்வு - டாக்டர் மு.வரதராசன்		
1. நம்பிக்கை		
2. புலனடக்கம்		
3. பண்பாடு		
Unit III	இலக்கணம்	04 h
1. வல்லினம் மிகும் மற்றும் மிகா இடங்கள்		
2. ர,ற,ல,ழ,ள,ந,ண,ன - வேறுபாடு அறிதல்		
Unit IV	கடிதங்கள்	05 h
1. பாராட்டுக் கடிதம்		
2. நன்றிக் கடிதம்		
3. அழைப்புக் கடிதம்		
4. அலுவலக விண்ணப்பங்கள்		
Unit V	பயிற்சிப் பகுதி	04 h
படைப்பாக்கப் பகுதி		
பொதுத் தலைப்புகளில் கவிதை, கட்டுரை எழுதச் செய்தல்		



Notes

அக மதிப்பீட்டுத் தேர்வு - வினாத்தாள் அமைப்பு முறை

மொத்த மதிப்பெண்கள் - 50

பகுதி - அ

சரியான விடையைத் தேர்வு செய்தல்

10x1=10

பகுதி - ஆ

கோடிட்ட இடங்களை நிரப்புக.

10x2=20

பகுதி - இ

இரண்டு பக்க அளவில் விடையளிக்க

2x10=20

குறிப்பு:


- அனைத்து அலகுகளில் இருந்தும் வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ -க்கான வினாக்கள் இது அல்லது அது என்ற அடிப்படையில் அமைதல் வேண்டும்

Text Book

- 1 சிறப்புத் தமிழ் - 2022-2023, தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை. (Unit- I to IV)

References

- 1 பேராசிரியர் புலவர் சோம. இளவரசு, எட்டாம் பதிப்பு. 2014. தமிழ் இலக்கிய வரலாறு - மணிவாசகர் பதிப்பகம், சென்னை.
- 2 டாக்டர் மு.வரதராசன். 2010. நல்வாழ்வு, பாரி நிலையம், சென்னை.
- 3 பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு. 2013. இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன் - பூவேந்தன் பதிப்பகம், சென்
- 4 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY. வலைதள முகவரி : <https://www.tamilvu.org>

		
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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
225CR1A2AA	HUMAN RIGHTS AND WOMEN'S RIGHTS	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- concepts of Human Rights.
- human Right Violations and Redressal Mechanism.
- rights to Women and Child.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of Human Rights	K1
CO2	Describe the Fundamental Rights	K2
CO3	Relate Human Right Violations and Redressal Mechanism.	K3
CO4	State the Rights to Women and Child	K2
CO5	Apply Civil and Political Rights of Women	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON:

<input type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



225CR1A2AA	HUMAN RIGHTS AND WOMEN'S RIGHTS	SEMESTER II
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Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Human Rights 04 h

Meaning - Definition - Nature - Content - Legitimacy of Human Rights - Origin and Development of Human Rights - Theories - Principles of Magna Carta - Modern Movements of Human Rights - The Future of Human Rights.

Unit II Human Rights in India 05 h

The Constitution of India - Fundamental Rights - Right to Life and Liberty - Directive Principles of State Policy - Fundamental Duties - Individual and Group Rights - Other facets of Human Rights - Measures for Protection of Human Rights in India.

Unit III Human Right Violations and Redressal Mechanism 05 h

Human Rights - Infringement of Human Right by State Machinery and by Individual - Remedies for State action and inaction - Constitutional Remedies - Public Interest Litigation (PIL) - Protection of Human Rights Act, 1993 - National Human Rights Commission - State Human Rights Commissions - Constitution of Human Right Courts.

Unit IV Rights to Women and Child 05 h

Matrimonial protection - Protection against dowry - Protection to pregnancy - Sexual offences - Law relating to work Place - Directive principles of Constitution (Article 39 a, d, e & Article 42, 43 & 46) - Trafficking of women - Constitutional Rights - Personal Laws - Protection of children against Sexual Offences Act 2012 (POCSO).

Unit V Civil and Political Rights of Women 05 h

Right of Inheritance - Right to live with decency and dignity - The Married women's Property Act 1874 - Women's right to property - Women Reservation Bill - National Commission for Women - Political participation - Pre independent political participation of women - Participation of Women in post independent period.



Text Books


- 1 Lalit Parmar, 1998, "Human Rights", Anmol Publications Pvt. Limited, New Delhi.
- 2 Krishna Pal Malik, 2009, "Women & Law ", Allahabad Law University, New Delhi.

References

- 1 Mandagadde Rama Jois, 2015, "Human Rights", Bharatiya Values, Bharatiya Vidya Bhavan Publications, Mumbai.
- 2 Paras Diwan and Piyush Diwan, 1994, "Women and Legal Protection", South Asia Books, Andhra Pradesh.
- 3 Venkataram and Sandhiya. N, 2001, "Research in Value Education", APH Publishing Corporation, New Delhi.
- 4 Anand A S, 2008, "Justice for Women: Concerns and Expressions", Universal Law Publishing Co., New Delhi.

Dr. N. G. P. Arts and Science College

BoS Chairman/HoD
Department of Computer Science with Data Analytics
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

 Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 7 th	AC - 14 th	GB - 19 th
02.12.22	19.01.23	30.01.23



Dr.NGPASC
COIMBATORE | INDIA

B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A3TA	TAMIL - III	LANGUAGE - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம், பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத்திறன்கள் (Life Skills) - மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K2
CO4	சூழலியல் ஆக்கம் (Ecology)	K3
CO5	மொழி அறிவு(Tamil knowledge)	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2				✓	
CO3		✓			
CO4	✓		✓		
CO5	✓			✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221TL1A3TA	TAMIL - III	SEMESTER III
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I காப்பியங்கள் 10 h

1. சிலப்பதிகாரம் - வழக்குரை காதை
2. மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை

Unit II காப்பியங்கள் 10 h

1. கம்பராமாயணம் - கும்பகர்ணன் வதைப்படலம்: பா. எண் : 60 முதல் - 100 வரை
2. பெரிய புராணம் - அதிபத்த நாயனார் புராணம்

Unit III சிற்றிலக்கியங்கள் 10 h

1. திருக்குற்றாலக்குறவஞ்சி - வசந்தவல்லி பந்தாடிய சிறப்பு (6: 4 கண்ணிகள்)
2. கலிங்கத்துப்பரணி- களம் பாடியது: போர்க்களக் காட்சி- பா.எண்: 472 முதல்- 502 வரை

Unit IV இலக்கிய வரலாறு 10 h

1. காப்பியங்களின் தோற்றமும் வளர்ச்சியும்
2. சிற்றிலக்கியங்களின் தோற்றமும் வளர்ச்சியும்
3. நாடகத்தின் தோற்றமும் வளர்ச்சியும்

Unit V இலக்கணம் & பயிற்சிப் பகுதி 08 h

அ. இலக்கணம்

1. 'பா' வகைகள் : வெண்பா, ஆசிரியப்பா, கலிப்பா, வஞ்சிப்பா - பொது இலக்கணம் மட்டும்.
2. அணி: உவமையணி, உருவக அணி, இல்பொருள் உவமையணி விளக்கம், உதாரணம்.

ஆ. பயிற்சிப் பகுதி

1. வாசகர் கடிதம் : நாளிதழ்,வானொலி,செய்தி ஊடகங்களுக்கு



விமர்சனம் எழுதுதல்

2.திரைக்கதை : மத்திய மற்றும் மாநில அரசு விருது பெற்ற தமிழ்த் திரைப்படங்கள் மட்டும்

Text Book

- 1 தமிழ் மொழிப்பாடம் - 2022-2023, தொகுப்பு: தமிழ்த்துறை, டாக்டர் என். ஜி. பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர். வெளியீடு: நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை. (Unit I to V)

References

- 1 பேராசிரியர் புலவர் சோம. இளவரசு, எட்டாம் பதிப்பு - 2014, தமிழ் இலக்கிய வரலாறு- மணிவாசகர் பதிப்பகம், சென்னை.
- 2 பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு- 2013, இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன் - பூவேந்தன் பதிப்பகம், சென்னை. .
- 3 தமிழ் இணையக் கல்விக்கழகம் - TAMIL VIRTUAL ACADEMY. வலைதள முகவரி: <https://www.tamilvu.org>



Course Code	Course Name	Category	L	T	P	Credit
221TL1A3HA	HINDI - III	LANGUAGE-I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- the techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓			✓
CO3	✓		✓	✓	
CO4					✓
CO5	✓	✓	✓		✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221TL1A3HA	HINDI - III	SEMESTER III
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

पद्य – काव्य पराशर (भोलानाथ)

(प्राचीन- कबीर, तुलसी, सुर, मीरा, आधुनिक- मैथिलीशरण गुप्त, अरूण कमल)

Unit II 10 h

हिन्दी साहित्य का इतिहास: (साधारण ज्ञान)

Unit III 10 h

अलंकार: अनुप्रास, यमक, श्लेष, वक्रोक्ति, उपमा, रूपक

Unit IV 10 h

संवाद लेखन

Unit V 08 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में)

(पाठ 10 to 20)

Text Books

- 1 प्रकाशक: जवाहर पुस्तकालय सदर बाजार, मथुरा उत्तर प्रदेश-281001 (Unit I)
- 2 आचार्य रामचन्द्र शुक्ल लोकभारती प्रकाशन इलाहाबाद. (Unit II)
- 3 प्रकाशक: विनोद पुस्तक मंदिर आगरा-282002 (Unit III)
- 4 पुस्तक: व्याकरण प्रदीप – रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024 (Unit IV)
- 5 प्रकाशक: दक्षिण भारत प्रचार सभा चेन्नई -17 (Unit V)



Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A3MA	MALAYALAM - III	LANGUAGE- I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	
CO2	✓				✓
CO3		✓	✓		
CO4	✓			✓	✓
CO5	✓	✓	✓		✓

COURSE FOCUS ON

✓ Skill Development	✓ Entrepreneurial Development
✓ Employability	✓ Innovations
✓ Intellectual Property Rights	✓ Gender Sensitization
✓ Social Awareness/ Environment	✓ Constitutional Rights/ Human Values/ Ethics



221TL1A3MA	MALAYALAM - III	SEMESTER III
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Poetry 10 h

Kumaranasan

Unit II Poetry 10 h

Kumaranasan

Unit III Poetry 10 h

Kumaranasan

Unit IV Poetry 10 h

Vayalar Ramavarma

Unit V Poetry 08 h

Vayalar Ramavarma

Text Books

- 1 Kumaranasan. 1998. Chinthavishtayaya Sitha. DC Books Kottayam, Kerala, India. (Unit I to III)
- 2 Ayisha (Poem), National Book Stall Kottayam, Kerala, India. (Unit IV & V)

Reference

- 1 Dr.M.Leelavathy. Kavitha Sahithya Charithram. Sahithya Academy Thrissur, Kerala, India.



Course Code	Course Name	Category	L	T	P	Credit
221TL1A3FA	FRENCH - III	LANGUAGE-I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written- Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Select the Plural, Articles and the Hobbies	K2
CO4	Measure the Cultural Activity in France	K3
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓				✓
CO2	✓	✓			
CO3			✓	✓	
CO4	✓	✓			✓
CO5	✓		✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input checked="" type="checkbox"/>	Intellectual Property Rights	<input checked="" type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



221TL1A3FA	FRENCH - III	SEMESTER III
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I 10 h

<ul style="list-style-type: none"> ° Décrire un lieu. ° Situer 	A partir d'une recherche de documents, composer une présentation touristique pour un magazine ou un site internet.	Comprendre la description d'un lieu. Décrire une ville ou une région qu'on aime. Interroger sur la situation d'un lieu. Comprendre des indications sur la fréquence d'actions.	Comprendre une présentation de catalogue touristique. Comprendre des pictogrammes. Comprendre la description d'un lieu et d'une situation précise dans un message électronique.
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Unit II 10 h

Se situer dans le temps.	A partir d'une recherche de documents, composer une présentation touristique pour un magazine ou un site internet.	Comprendre la description d'un lieu. Décrire une ville ou une région qu'on aime. Interroger sur la situation d'un lieu. Comprendre des indications sur la fréquence d'actions.	Comprendre une présentation de catalogue touristique. Comprendre des pictogrammes. Comprendre la description d'un lieu et d'une situation précise dans un message électronique.
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Unit III 10 h

Raconter. ° Décrire les étapes d'une action.	Raconter une scène insolite à l'oral et à l'écrit.	Comprendre le récit d'un voyage. Raconter ses actions quotidiennes.	Ecrire une biographie à partir d'éléments écrits.
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Unit IV 10 h

Exprimer l'intensité et la quantité. ° Interroger.	Raconter une scène insolite à l'oral et à l'écrit.	Comprendre le récit d'un voyage. Raconter ses actions quotidiennes.	Ecrire une biographie à partir d'éléments écrits.
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Unit V 08 h

Make in Own Sentences based on the above Lessons
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Text Book

- 1 LATITUDES I (Méthode de français) Pages from 102-127, Author : Regine Mérieux, Yves Loiseau (Unit I to IV)



Dr. NGPASC

COIMBATORE | INDIA

B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221EL1A3EA	PROFESSIONAL ENGLISH - III	LANGUAGE- II	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the basics of English grammar and specific usage
- the importance of the vocabulary and use in different contexts
- the necessity of communication and composition writing skills

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Infer the specific usage of while-listening process	K2
CO2	Organize the various abilities and sub-skills involved in reading	K3
CO3	Utilize the importance of speaking skills and developing it through various practices	K3
CO4	Assume the sentence construction and paragraph development	K4
CO5	Acquire all-round mature outlook to function effectively in different context	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1			✓		✓
CO2	✓	✓		✓	
CO3	✓		✓		✓
CO4	✓		✓		
CO5		✓		✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221EL1A3EA	PROFESSIONAL ENGLISH - III	SEMESTER III
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Listening and Reading 09 h

Listening in casual conversation, Small group and Conference setting - Listening for Factual Information, Detail and Situation - Developing Listening skills- Why do we avoid Listening- Poor Listening - Disadvantages - Poor listening vs Effective Listening - Basics of Reading- efficient and inefficient readers- Advantages - Benefits and Effective reading and comprehension skills- Need for Developing Efficient Reading skills- Four Basic steps of Effective Reading - Stumbling blocks in becoming an effective Reader- Improving Vocabulary power- Strategies for Comprehending and Retaining content- Effective Note Taking while Reading

Unit II Speaking 11 h

Purpose of General Conversations- Advantages, features of a good conversation- Tips for improving conversation- public speaking- importance of public speaking- Benefits, Tips, Overcoming fear of public speaking- Preparatory steps - Structuring the contents- Audience Awareness- Mode of Delivery

Unit III Writing Skills 10 h

CV and Job Applications- How to make your letter stand out?- Employers expectation - Organize the material - Useful suggestions- Cover Letter- Content to be included - Tone of the letter - Report Writing- importance - features- Types - main parts - Feasibility report- Accident report- Scientific report- Memos - Introduction - Structure- Proposal Writing- Key factors- Types- Contents- Format- Evaluation

Unit IV Effective Skills in Language 10 h

Using Word's Effectively- Mastering Spelling Techniques- Structuring Phrases and Clauses- Writing Effective Sentences- Building Effective paragraphs- Revising, Editing and Proof reading

Unit V Soft Skills 08 h

Introduction- What are soft skills?- Importance of soft skills- Attributes- Social soft skills- Thinking- Negotiating- Exhibiting- Identifying- Improving- Will formal training enhance your soft skills? - Soft Skills training -Train Yourself- Practicing soft skills- Measuring attitude - Self-Discovery: Importance of knowing yourself- Process - SWOT analysis - Benefits - Usage - SWOT Analysis grid



Text Books

- 1 Camp and Satterwhite. 1998. College English and Communication. 7th Edition
Glencoe Mchrawtill Publishers, New York, Unites States of America. (Unit I,
II, III)
- 2 Kumar, Sanjay and Lata Pushp. 2018. Language and Communication Skills for
Engineers. First Edition, Oxford University Press, India. (Unit I, II, III)
- 3 Mohan, Krishna and Banerji, Meera. 2009. Developing Communication skills.
2nd Edition, Macmillcan, India. (Unit I, II, III, IV)
- 4 Alex. Soft Skills. 2009. S. Chand Publishing, New Delhi, India. (Unit V)

References

- 1 Ghosh, B.N. Editor. 2017. Managing Soft Skills for Personality Development.
McGraw- Hill Education, Chennai, India.
- 2 Miles Craven. 2008. Cambridge English Skills Real Listening and Speaking.
First Edition, Cambridge University Press, United Kingdom.
- 3 Mishra, Gauri and Ranjana Kaul. 2016. Language Through Literature. Primus
Books, India.
- 4 Pillai G, Radhakrishna. 2000. English for Success. Emerald Publishers,
Chennai, India.



Course Code	Course Name	Category	L	T	P	Credit
224DA1A3CA	DATABASE SYSTEM CONCEPTS	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Fundamentals of database design
- Concepts using relational data model
- Introduction to NoSQL

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of database	K2
CO2	Apply SQL queries for a given context in relational database	K3
CO3	Apply the knowledge of relational database design	K3
CO4	Analyze storage techniques and transaction management	K4
CO5	Apply the distributed database concepts and NOSQL database	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓		
CO5	✓	✓	✓	✓	✓

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Computer Science with Data Analytics(Students admitted during the AY 2022-23)

224DA1A3CA	DATABASE SYSTEM CONCEPTS	SEMESTER III
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Relational Databases 8 h

Introduction to the Relational Model - Structure - Database Scheme - Keys - Schema Diagrams - Relational Query Languages - Relational Operations. Introduction to SQL: Overview of the SQL Query Language- SQL Data Definition - Basic Structure - Additional Operations - Set Operations - Null Values - Aggregate Functions - Nested Subqueries

Unit II Intermediate and Advanced SQL 10 h

Intermediate SQL: Join Expressions - Views - Transactions - Integrity Constraints - SQL Data Types and Schemas - Authorization. Advanced SQL: Accessing SQL From a Programming Language - Functions and Procedures - Triggers - Recursive Queries - Advanced Aggregation Features - Online Analytical Processing

Unit III Database Design 10 h

Database Design and the E-R Model: Overview of the Design Process - Entity-Relationship Model - Constraints - Removing Redundant Attributes - Entity-Relationship Diagrams - Reduction to Relational Schemas - Entity-Relationship Design Issues - Extended E-R Features. Relational Database Design: Features - Atomic Domains and First Normal Form - Second and Third Normal Forms- Decomposition using Functional Dependencies - Boyce Codd Normal Form (BCNF).

Unit IV Transaction Management 10 h

Transactions: Transaction Concept - A Simple Transaction Model - Storage Structure - Transaction Atomicity and Durability - Transaction Isolation - Serializability - Transaction Isolation and Atomicity - Transaction Isolation Levels - Implementation - Transactions as SQL Statements. Concurrency Control: Lock-Based Protocols - Deadlock Handling - Timestamp-Based Protocols - Validation-Based Protocols.

Unit V Modern Databases 10 h

Distributed Databases: Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Transactions - Distributed Query Processing. NoSQL



Databases: Introduction - Column Oriented Stores - Key/Value Stores - Document Databases - Graph Databases - CRUD Operations

Text Books

- 1 A.Silberchartz, H.F.Korth, S.Sudarshan (2019), "Database System concepts", (7th Edn.), Mc Graw Hill. Unit 1 - V
- 2 Shashank Tiwari (2011), "Professional NoSQL", John Wiley & Sons, Inc. Unit V

References

- 1 Nilesh Shah, 2005, "Database Systems Using Oracle : A Simplified Guide to SQL and PL/SQL", Second Edition, Pearson Education
- 2 Raghuram Krishnan, Johnanes Gehrke,(2011), "Database Management System", (3rd Edn.), Mc Graw Hill
- 3 O`neil Patricand, O`neil Elizabeth,(2008), "Database Principles, Programming and Performance", (2nd Edn.), Margon Kaufmann Publishers Inc
- 4 Elmasri Ramez and Navathe Shamkant.B, (2010), "Fundamentals of Database System Concepts", (6th Edn.), Addison Wesley



Course Code	Course Name	Category	L	T	P	Credit
224CS1A3CA	OPERATING SYSTEMS	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The Evolution of Operating systems, its functions and process
- The Process Scheduling and Deadlock Techniques
- The Memory and Storage Management

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the evolution of OS functions and Process	K1
CO2	Learn Process Scheduling	K1,K2
CO3	Understand Deadlock Techniques	K2,K3
CO4	Acquire Knowledge on Memory Management	K3
CO5	Apply the concepts on storage management	K3,K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓		
CO5	✓	✓	✓	✓	✓

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224CS1A3CA	OPERATING SYSTEMS	SEMESTER III
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Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Operating Systems 6 h

Computer System Organization - Computer System Architecture - Operating System Structure - Distributed Systems - Open Source Operating Systems - Operating System Generation

Unit II Process Scheduling 8 h

Process Concepts - Operations on Processes. Basic Concepts - Scheduling Criteria - Scheduling Algorithms: First-Come First-Served Scheduling - Shortest-Job-First Scheduling - Priority Scheduling - Round-Robin Scheduling - Multilevel Queue Scheduling. Synchronization: Background - The Critical - Section Problem - Semaphores.

Unit III Deadlocks 8 h

Deadlocks: Deadlock Characterization - Methods for Handling Deadlock - Deadlock Prevention - Deadlock Avoidance: Safe State - Resource-Allocation Graph Algorithm - Banker's Algorithm - Deadlock Detection - Recovery from Deadlock

Unit IV Memory Management 8 h

Memory Management: Swapping - Contiguous Memory Allocation - Paging - Structure of Page Table - Segmentation. Virtual Memory: Demand Paging - Page Replacement: Basic Page Replacement - FIFO Page Replacement - Optimal Page Replacement - LRU Page Replacement

Unit V Storage Management 6 h

Secondary-Storage Structure : Disk Structure - Disk Scheduling: FCFS Scheduling - SSTF Scheduling SCAN Scheduling-C-SCAN Scheduling-LOOK Scheduling- Selection of a Disk Scheduling Algorithm - RAID structure.

Case Studies: Linux System, Mobile Operating System.



Text Books

- 1 Silberschatz , Galvin , Gagne, 2018, "Operating System Concepts", 9th Edition, Wiley.

References

- 1 Andrew S. Tanenbaum ,2018,"Modern Operating Systems 4e " ,Pearson Education India
- 2 Mukesh Singhal, Niranjana G. Shivaratri, 2019, "Advanced Concepts in Operating System", 10th edition, McGrawHill.
- 3 William Stallings,2017,"Operating Systems: Internals and Design Principles", 9th Edition, Pearson Education.
- 4 Herbert Bos, S.Tanenbaum, 2020,"Modern Operating System",6th Edition Pearson education.



Course Code	Course Name	Category	L	T	P	Credit
224AI1A3CP	PROGRAMMING IN JAVA	CORE PRACTICAL	3	-	4	5

PREAMBLE

This course has been designed for students to learn and understand

- The object-oriented programming concepts, and apply them in solving problems.
- The implementation of packages and interfaces.
- To design of Graphical User Interface and Collections using Java.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the Java Language fundamentals.	K2
CO2	Develop reusable programs using the concepts of inheritance, polymorphism and interfaces.	K3
CO3	Apply the exception handling to develop efficient and error free codes.	K3
CO4	Apply the concepts of multithreading and design event driven GUI and web related applications.	K3
CO5	Demonstrate the implementation of JDBC and Collection classes.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓		
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224AI1A3CP	PROGRAMMING IN JAVA	SEMESTER III
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Total Credits: 5

Total Instruction Hours: 84 h

Syllabus

Unit I Java Fundamentals 17 h

Introduction – Data Types – Variables – Operators – Strings – Input and Output – Control flow – Arrays – Objects and Classes – Static Fields and Methods – Method Parameters – Object Construction.

- Simple Java programs to demonstrate the use of language fundamentals.
- Programs to demonstrate the Classes, Objects, and Constructors in Java.
- Programs to implement the Method and Constructor overloading.
- Programs to demonstrate the use of Scanner class.

Unit II Inheritance and Interfaces 17 h

Classes, Super Classes and Sub Classes – Polymorphism – Casting – Abstract Classes – Interfaces: Properties – Interface Concepts – Lambda Expressions – Inner Classes.

- Demonstrate Single, Multilevel and Hierarchical Inheritance in Java.
- Programs to implement Abstract classes with example.
- Program to implement Interface using extends keyword.
- Develop programs using static and private inner classes.

Unit III Exception Handling and Packages 17 h

Dealing with Errors – Catching Exceptions – Tips for using Exceptions – Packages: Package Names – Class Importation – Static Imports – Adding classes into Packages – Package Access.

- Study and Implementation of Checked Exceptions.
- Study and Implementation of Unchecked Exceptions.
- Programs to demonstrate Packages in Java.

Unit IV Threads and GUI Programming 17 h

Introduction to Threads – Thread States – Properties – Synchronization – GUI : Java User Interface Toolkits – Displaying Frames – Displaying Information – Event Handling – API.

- Program to implement thread using runnable interface.
- Program to creating multiple threads and setting priorities.
- Demonstrate the producer-consumer problem.
- Create a simple GUI application in Java.



Unit V JDBC and Collections

16 h

JDBC: Architecture - JDBC - ODBC - Types of Drivers - Components - Interfaces and classes - Steps for querying the database with JDBC. Collections: Java Collections Framework - Interfaces in Collections - Concrete Collections.

- a) Programs to implement JDBC connectivity.
- b) Programs to demonstrate the interfaces in collections.
- c) Programs to implement the concrete collection classes.

Text Books

- 1 Cay S Horstmann ,(2020),"Core Java Volume-1 Fundamentals", (11th Edn.), Pearson Indian Education Services Pvt. Lt, India.
- 2 Herbett Schildt, (2014), "Java: The Complete Reference", Ninth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

References

- 1 C. Xavier, 2010, "Programming with JAVA 2", SciTech Publication, Chennai.
- 2 Paul Deitel and Harvey Deitel, 2015, "Java How to Program", Tenth Edition, Deitel & Associates, Inc Publications.
- 3 Instructional Software Research and Development (ISRD) Group, 2007, "Introduction to Object Oriented Programming through Java", Tata McGraw-Hill Publishing Company Limited, New Delhi.



224DA1A3SP	SEC I : DATABASE SYSTEMS	SEMESTER III
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Total Credits: 2

Total Instructions Hours: 48 h

S.No	Contents
1	Create a database and apply the Data Definition Language
2	SQL Queries to perform the Data Manipulation Language.
3	Create a database to set various constraints.
4	SQL Queries to perform expression and Conditions.
5	Create and implement aggregate functions.
6	Create and implement types of Joins.
7	Perform views, synonyms and sequence
8	Implement Cursors in PL/SQL.
9	Implement Triggers in PL/SQL.
10	Handle exceptions in PL/SQL.
11	Perform CRUD operations in MongoDB
12	Import and Export files in MongoDB.

Note: Any 10 are Mandatory.



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B.Sc. Computer Science with Data Analytics(Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
222MT1A3ID	DISCRETE MATHEMATICS	IDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the logical operators and applications
- the concept of relation and functions.
- the application of graph theory, trees and automata.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	learn the concept of set theory	K1
CO2	interprets the various optimization problems in the term of relations and functions	k2
CO3	identify applications of logical operators	k2
CO4	model and solve real world problems using graphs and theory	K4
CO5	relate the concept of Finite state automation in practical problems.	k3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓		
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓		

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



222MT1A3ID	DISCRETE MATHEMATICS	SEMESTER III
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Set Theory 9 h

Set and its elements - set description - types - Venn-Euler Diagrams - set operations and laws of set theory - fundamental products - index and indexed sets - partitions of sets - minsets - countable and uncountable sets - Algebra of sets and duality - computer representation - the inclusion and exclusion principle

Unit II Relations and Functions 10 h

Relations: Introduction - cartesian product of sets - binary relations - set operation on relations - types- partial order relation - equivalence relation and classes- Functions: Introduction - types - invertible functions - composition of functions.

Unit III Mathematical Logic 10 h

Propositional calculus - basic logical operations - statements generated by a set - conditional statements - converse, inverse and contrapositive statements - biconditional - tautologies - contradiction - contingency - argument - methods of proof - equivalence and implication

Unit IV Graph Theory and Trees 10 h

Basic terminologies - paths, cycles and connectivity - subgraphs - types - isomorphic and homeomorphic graphs - representation of graphs in computer memory- Eulerian and Hamiltonian graphs - cartesian product - shortest path.

Trees: Properties - binary trees - complete binary tree - tree of an Algebraic expression - traversing binary trees.

Unit V Language, Grammar and Automata 9 h

Language: the set theory of strings - languages - regular expressions and regular languages - grammar - finite state machine - finite state automata.

Note: 20% Theory and 80% Problem



Text Books

- 1 Sharma J.K., 2022, "Discrete Mathematics", 4th Edition, Trinity Press, New Delhi.

References

- 1 Tremblay J.P. and Manohar R., 1997, "Discrete Mathematics Structures with Applications to computer science", 2nd Edition, Mc Graw Hill International, New York.
- 2 Venkataraman M.K, Sridharan N. and Chandrasekaran N., 2000, "Discrete Mathematics ", The National publishing Company, Chennai.
- 3 Kolman B, Busby R.C. and Ross S.C., 2006, "Discrete Mathematical Structures", 5th Edition., Prentice Hall of India Pvt. Ltd., New Delhi.
- 4 Kenneth H. Rosen., 1999, "Discrete Mathematics and its Applications", 4th Edition, Mc Graw-Hill Professional-China.



224DA1ASSA	DECISION SUPPORT SYSTEMS	SEMESTER III
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Total Credit: 1

Syllabus

Unit I Introduction

Introduction - Evolution of Decision Support Systems(DSS)- Benefits -Users-Decision -Decision process- Types of Decisions- Business Decisions-Information Systems- DSS as Information systems - Models.

Unit II Decision Support Systems

DSS Hierarchy : Overview – DSS Types -DSS Architecture -DSS Client/Server Computing - The Internet and Client / Server Computing in DSS

Unit III Software Tools

Software Categories - Standard packages - Specialized Tools and Generators- Programming Languages for DSS -DSS User Interfaces

Unit IV Group DSS

Group DSS : Need for Group DSS - Group Vs Individual Activities – Types- Groupware- Group DSS in Use Today - Groupware products

Unit V Building and Implementation

Decision Support System Development Process - DSS Development Project Participants - The Implementation stage - Implementation Issues - Ethical Issues in DSS Implementation.



Text Books

- 1 Efrem G. Mallach,(2002),"Decision Support and Data Warehouse Systems", (1st Edn.),Tata Mcgraw Hill Publishers

References

- 1 Marakas, G.M.,(2009),"Decision Support Systems in the 21st century", (2nd Edn), PHI Learning
- 2 Taylor, J.,(2011),"Decision Management Systems: A Practical Guide to Using Business Rules and Predictive Analytics",IBM Press



224DA1ASSB	SOFTWARE TESTING	SEMESTER III
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Total Credit: 1

Syllabus

Unit I Functional Testing

Introduction- Software failures- Testing Process-Testing terminologies -Limitation of testing- V shaped software lifecycle model. Functional Testing: Boundary Value Analysis - Equivalence Class Testing - Decision Table Based Testing

Unit II Structural Testing

Structural Testing and Software verification: Control flow testing- Data flow testing- Slice based testing- Mutation Testing - Verification methods- Software Requirements Specification(SRS) document verification - Source Code Reviews- User Document Verification

Unit III Software Testing Activities

Software Testing Activities, Models and Metrics: Levels of testing- Debugging - Software test plan -Software Testing Tools- Software Metrics- Categories of Metrics

Unit IV Regression Testing

Test cases and Use cases: Use case diagram and use cases- Generation of test cases from use Cases - Guidelines for generating validity checks - Database Testing- Regression testing - Test cases -Reducing the number of test cases

Unit V Testing Methods

Object oriented Testing and Testing the Web: Path Testing - State Based Testing - Class Testing- Web Testing- Functional Testing- User Interface Testing- Usability Testing - Configuration and Compatibility Testing - Security Testing - Performance Testing




Text Books

- 1 SinghYogesh,(2012) "Software Testing", (1st Edn), Cambridge press

References

- 1 Mathur P Aditya,(2008),"Foundations of Software Testing", (1st Edn) Pearson Education.
- 2 Glenford J. Myers, Corey Sandler,(2011), "The Art of Software Testing", (1st Edn), Wiley

W. P. Joshi
 16/23
 BoS Chairman/HoD
 Department of Computer Science with Data Analytics
 Dr. N. G. P. Arts and Science College
 Coimbatore – 641 048

 Dr. N. G. P. Arts and Science College		
APPROVED		
BoS- 6 th 09.06.23	AC- 15 th 14.07.23	GB- 20 th 05.08.23



Course Code	Course Name	Category	L	T	P	Credit
221TL1A4TA	TAMIL - IV	LANGUAGE-I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடு நாகரீகம், பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
- கலை மற்றும் மரபுகளை அறியச் செய்தல்
- மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத் திறன்கள் (Life Skills)- மாணவர்களின் செயலாக்கத் திறனை ஊக்குவித்தல்	K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K4
CO3	பாட இணைச்செயல்பாடுகள் (Co-curricular activities)	K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1		✓	✓		✓
CO2	✓			✓	
CO3		✓			✓
CO4			✓		
CO5	✓			✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221TL1A4TA	TAMIL - IV	SEMESTER IV
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I எட்டுத்தொகை 10 h

1. நற்றிணை – குறிஞ்சித் திணை

I.பா.எண் : 01 – கபிலர்

II.பா.எண் : 88 – நல்லந்துவனார்

III.பா.எண் : 102 – செம்பியனார்

2. குறுந்தொகை – முல்லைத்திணை

I.பா.எண் : 65 – கோலூர்கிழார்

II. பா.எண் : 167 – கூடலூர்கிழார்

மருதத்திணை

I.பா.எண் : 08 – ஆலங்குடி வங்கனார்

II.பா.எண் : 61 – தும்பிசேர்கீரனார்

III.பா.எண் : 196 – மிளைக் கந்தன்

நெய்தல் திணை

I.பா.எண் : 57 – சிறைக்குடி ஆந்தையார்

Unit II எட்டுத்தொகை 08 h

1. கலித்தொகை – பாலைக்கலி

I.பா.எண் : 09 – பெருங்கடுங்கோ

2. அகநானூறு – மருதத்திணை

I.பா.எண் : 86 – நல்லாலூர்கிழார்

3. புறநானூறு -

I.பா.எண் : 188 – பாண்டியன் அறிவுடை நம்பி

II.பா.எண் : 192 – கணியன் பூங்குன்றனார்

III.பா.எண் : 279 – ஒக்கூர் மாசாத்தியார்

IV.பா.எண் : 312 – பொன்முடியார்

Unit III பத்துப்பாட்டு 10 h

1. பட்டினப் பாலை – கடியலூர் உருத்திரங் கண்ணனார் -1முதல் 218 வரிகள் வரை மட்டும்.

Unit IV இலக்கிய வரலாறு 10 h

1. எட்டுத் தொகை நூல்கள்

2. பத்துப்பாட்டு நூல்கள்

Unit V இலக்கணம் மற்றும் திறனாய்வுப் பகுதி 10 h

I.இலக்கணம்

1. அகத்திணை – அன்பின் ஐந்திணை - விளக்கம்

2. புறத்திணை – 12 திணைகள் - விளக்கம்

II.பயிற்சிப் பகுதி



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B.Sc. Computer Science with Data Analytics(Students admitted during the AY 2022-23)

சங்கப் பாடல்கள் குறித்து திறனாய்வு செய்தல்

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

Text Book

- செய்யுள் திரட்டு - மொழிப் பாடம் - 2022- 23
- 1 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, வெளியீடு : நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை – 600 098. (Unit I- V)

References

- 1 பேராசிரியர் புலவர் சோம. இளவரசு, எட்டாம் பதிப்பு -2014, தமிழ் இலக்கிய வரலாறு - மணிவாசகர் பதிப்பகம், சென்னை.
- 2 பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு- 2013, இலக்கணம் -இலக்கிய வரலாறு - மொழித்திறன் -பூவேந்தன் பதிப்பகம், சென்னை.
- 3 தமிழ் இணையக் கல்விக்கழகம்.<<http://www.tamilvu.org/>>



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B.Sc. Computer Science with Data Analytics(Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A4HA	HINDI - IV	LANGUAGE-I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature
- the techniques for expansion of ideas and translation process

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓			✓
CO3	✓		✓	✓	
CO4					✓
CO5	✓	✓	✓		✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input checked="" type="checkbox"/> Innovations
<input checked="" type="checkbox"/> Intellectual Property Rights	<input checked="" type="checkbox"/> Gender Sensitization
<input checked="" type="checkbox"/> Social Awareness/ Environment	<input checked="" type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



221TL1A4HA	HINDI- IV	SEMESTER IV
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I	10 h
नाटक	
Unit II	10 h
एकांकी	
Unit III	10 h
काव्य मंजरी	
Unit IV	10 h
सूचना लेखन	
Unit V	08 h
अनुवाद अभ्यास- III	

Text Books

- 1 लडाई – सर्वेश्वरदयाल सक्सेना प्रकाशक: वाणी प्रकाशन 21-A, दरियागंज नई दिल्ली-110002. (Unit I)
- 2 एकांकी पंचामृत – डॉ राम कुमार (भोर और तारा छोडकर) प्रकाशक: जवाहर पुस्तकालय सदर बाजार, मथुरा उत्तर प्रदेश-281001. (Unit II)
- 3 काव्य मंजरी- (डा मुन्ना तिवारी) मैथिलीशरण गुप्त- मनुष्यता, जयशंकर प्रसाद- बीती विभावरी जागरी सूर्यकान्त त्रिपाठी निराला- तोडती पत्थर और भिक्षुक. (Unit III)
- 4 सूचना लेखन पुस्तक: व्याकरण प्रदिप – रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद -211024. (Unit IV)
- 5 अनुवाद अभ्यास (केवल अंग्रेजी से हिन्दी में) (पाठ 10 to 20) प्रकाशक: दक्षिण भारत प्रचार सभा चेन्नई -17 (पाठ 10 to 20). (Unit V)



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
221TL1A4MA	MALAYALAM- IV	LANGUAGE - I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill
- the various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process
- the competency in translating simple Malayalam sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the fundamentals of novels and stories	K1
CO2	Understand the principles of translation work	K2
CO3	Expose the knowledge writing critical views on fiction	K2
CO4	Build creative ability	K3
CO5	Apply the power of creative reading	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	
CO2	✓				✓
CO3		✓	✓		
CO4	✓			✓	✓
CO5	✓	✓	✓		✓

COURSE FOCUS ON

✓ Skill Development	✓ Entrepreneurial Development
✓ Employability	✓ Innovations
✓ Intellectual Property Rights	✓ Gender Sensitization
✓ Social Awareness/ Environment	✓ Constitutional Rights/ Human Values/ Ethics



221TL1A4MA	MALAYALAM- IV	SEMESTER IV
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I	Drama	10 h
Saketham- Sreekandan Nair		
Unit II	Drama	10 h
Saketham- Sreekandan Nair		
Unit III	Drama	10 h
Saketham- Sreekandan Nair		
Unit IV	Screen Play	10 h
Perumthachan- Vasudevan Nair		
Unit V	Screen Play	08 h
Perumthachan- Vasudevan Nair		

Text Books

- 1 Nair, Sreekandan C.N. 2023. Saketham, Drama. DC Books Kottayam, Kerala, India. (Unit I to III)
- 2 Nair, Vasudevan M.T. 1994. Perumthachan- Screenplay. DC Books Kottayam, Kerala, India. (Unit IV & V)

Reference

- 1 Sankarapillai. 2005. Malayala Nataka Sahithya Charithram, Kerala Sahithya Akademi Publishers, Kerala, India.



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Course Code	Course Name	Category	L	T	P	Credit
221TL1A4FA	FRENCH - IV	LANGUAGE-I	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the Competence in General Communication Skills – Oral + Written- Comprehension & Expression
- the Culture, life style and the civilization aspects of the French people as well as of France
- the students to acquire Competency in translating simple French sentences into English and vice versa

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Basic verbs, numbers and accents	K1
CO2	Apply the adjectives and the classroom environment in France	K2
CO3	Select the Plural, Articles and the Hobbies	K2
CO4	Measure the Cultural Activity in France	K3
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓				✓
CO2	✓	✓			
CO3			✓	✓	
CO4	✓	✓			✓
CO5	✓		✓	✓	✓

COURSE FOCUSES ON

✓ Skill Development	✓ Entrepreneurial Development
✓ Employability	✓ Innovations
✓ Intellectual Property Rights	✓ Gender Sensitization
✓ Social Awareness/ Environment	✓ Constitutional Rights/ Human Values/ Ethics



221TL1A4FA	FRENCH - IV	SEMESTER IV
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

10 h

Unit I

° Décrire quelqu'un. ° Comparer	En milieu professionnel, recruter quelqu'un et justifier son choix.	S'exprimer sur les styles de vêtements. Reconnaître des personnes à partir de descriptions.	Comprendre la description de personnes dans un extrait de roman.
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10 h

Unit II

Exprimer l'accord ou le désaccord. ° Se situer dans le temps.	En milieu professionnel, recruter quelqu'un et justifier son choix.	Décrire des personnes. Comprendre des personnes qui expérimentent leur accord ou leur désaccord.	Comprendre des différences de points de vue exprimés dans un message électronique. Raconter un souvenir.
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10 h

Unit III

° Parler de l'avenir.	Discuter de l'organisation d'un voyage de groupe puis préparer une fiche projet et la compléter.	Comprendre une chanson. Échanger sur ses projets de vacances.	Comprendre le message d'une carte d'anniversaire.
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10 h

Unit IV

° Exprimer des souhaits. ° Décrire quelqu'un.	Discuter de l'organisation d'un voyage de groupe puis préparer une fiche projet et la compléter.	Discuter du programme de la soirée à venir. Addresser des souhaits à quelqu'un.	Comprendre le message d'une carte d'anniversaire.
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08 h

Unit V

Make in Own Sentences based on the above Lessons

Text Book

- 1 LATITUDES 1 (Méthode de français) Pages from 128-151, Author : Regine Mérieux, Yves Loiseau (Unit I to IV)



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Course Code	Course Name	Category	L	T	P	Credit
221EL1A4EA	PROFESSIONAL ENGLISH - IV	LANGUAGE- II	3	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- the skill-based learning for better communication
- the prevalent issues logically and present coherently
- the ideas accurately and clearly

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop the ability to appreciate ideas and think critically	K1
CO2	Integrate academic success into practical life skills	K2
CO3	Express challenges of a competitive environment and select the profession that best suits them	K2
CO4	Discuss with confidence in conversations, to initiate, sustain and close a conversation	K3
CO5	Identify a sense of social commitment	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓
CO2	✓	✓		✓	
CO3			✓	✓	✓
CO4		✓			✓
CO5	✓		✓	✓	

COURSE FOCUSES ON

✓ Skill Development	✓ Entrepreneurial Development
✓ Employability	✓ Innovations
✓ Intellectual Property Rights	✓ Gender Sensitization
✓ Social Awareness/ Environment	✓ Constitutional Rights/ Human Values/ Ethics



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221EL1A4EA	PROFESSIONAL ENGLISH - IV	SEMESTER IV
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Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I Career 08 h

Leadership- Everyday leadership- Everyday leaders motivation- Qualities of a good leader- Professionalism- Creativity- Practical Application- Ways to become more creative- Six Thinking hats techniques

Unit II Art of Promoting 11 h

Selling your skills- Neuromarketing as a tool for influencing leaders- Using neuromarketing and psychology to get ahead- Recruiters and Clients decision making skills- Three steps to use neuromarketing for a successful life- Attention-storytelling- Perception and reputation- Recognize opportunities and openings before the competition- observation- Matching yourself with your leaders

Unit III Facing Challenges 10 h

Introduction-Panicky people- Negative people- Positive people- Facing challenges and taking initiatives - Importance of youth to face challenges and take initiative Benefits of Facing challenges- Facing challenges in life

Unit IV Effective Decision Making 10 h

Decision Making Process- Methods of Decision Making- Steps in DM- Theoretical Approaches to individual Decision Making- Optimizing Decision Theory- The Subjective Expected Utility Model- Steps to Effective Decision- Making- Effective Decision Making in Terms- Methods for team decision making- Confusion and decision making- Decision making styles

Unit V Practising Corporate Social Responsibility (CSR) 09 h

Corporate Social Responsibility (CSR)- definitions- Goal- Areas- Need- Benefits - Argument in favour/against of CSR- Factors that promote CSR - Limitations for implementing- India and Corporate Social Responsibility- Activities carried out by Companies in India- List of projects for funding under CSR- Implementation of CSR commitments



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Text Books

- 1 Sharma, Prashant. 2022. Soft Skills. BPB Publications, 3rd Edition, New Delhi, India. (Unit I & II)
- 2 Alex. 2013. Managerial Skills. S. Chand Publishing, New Delhi, India. (Unit III to V)
- 3 Alex. 2009. Soft Skills. S. Chand Publishing, New Delhi, India. (Unit II)
- 4 E H McGrath S J. 2011. Basic Managerial Skills for All, 9th Edition, New Delhi, India. (Unit III)

References

- 1 Adair J. 1986. Effective Team Building: How to make a winning team. Pan Books, London, United Kingdom.
- 2 Dhanavel S P. 2010. English and Soft Skills, Orient Blackswan, Hyderabad, India.
- 3 Singh S R. 2011. Soft Skills. APh Publishing Corporation, New Delhi, India.
- 4 Lakshminarayanan K R, Murugavel T. 2015. Managing Soft Skills. Scitch Publications, Chennai, India.



Course Code	Course Name	Category	L	T	P	Credit
224AI1A4CA	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The foundations of Artificial Intelligence.
- The basic areas of artificial intelligence including problem solving, knowledge representation and reasoning.
- To demonstrate working knowledge of reasoning in the presence of uncertain information.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate fundamental understanding of the history of AI and its foundations.	K2
CO2	Understand and implement the informed and uninformed search techniques in AI.	K3
CO3	Explain the formal methods of knowledge representation.	K2
CO4	Apply logic and reasoning techniques to AI applications.	K3
CO5	Recognize the importance of various AI applications and expert systems.	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓		✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5		✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



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224AI1A4CA	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	SEMESTER IV
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Foundations of AI 08 h

Introduction - Definitions - History of AI - AI Problems and Techniques - Problem Solving Methods: Introduction - State Space Search - Production Systems - Problem Characteristics - Control Strategies - Issues in the design of search programs - Search Strategies.

Unit II Informed and Uninformed Search 10 h

Introduction - Generate and Test Method - Hill Climbing Method - Best First Search and A* Search - Means End Analysis - Intelligent Agents and Environments - Problem Reduction - AO* Algorithm - Constraint Satisfaction with Inference - Local Search Algorithms.

Unit III Knowledge Representation 10 h

Introduction - Ontologies, Objects and Events - Representations and Mappings - Approaches to Knowledge Representation - Forward Vs Backward Chaining - Matching and Control Knowledge - Slot and Filler Structures - Issues in Knowledge Representation - Developments in Knowledge Representation.

Unit IV Logic in AI 10 h

Overview - Propositional Logic - First Order Logic - Prolog: Logic Programming - Symbolic Logic - Conversion: English to Prolog - Terminologies - Variables and Operators - Inference Process - Tracing Model of Execution - List Structures - Operations - Drawbacks of Prolog - Applications of Prolog.

Unit V Applications of AI and Expert Systems 10 h

Game Playing : Minimax Search Procedure - Alpha - Beta Cutoff - Text Analysis and Mining : Language Models - Text Classification - Information Retrieval - Information Extraction - Expert systems: Introduction - Knowledge Representation - Expert System Shells - Knowledge Acquisition - Applications of Expert Systems.



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Text Books

- 1 Lavika Goel, (2021), "Artificial Intelligence – Concepts and Applications ", (1st Edn.), Wiley India Pvt. Ltd.
- 2 Stuart Russell and Peter Norvig, (2011), "Artificial Intelligence - A Modern Approach", (3rd Edn.), Prentice Hall.

References

- 1 Elaine Rich, Kevin Knight and Shiv Shankar B. Nair, (2009)," Artificial Intelligence (SIE)", (3rd Edn.), Tata McGraw Hill.
- 2 Wolfgang Ertel, (2017)," Introduction to Artificial Intelligence", (2nd Edn.), Springer.
- 3 Stephen Lucci and Danny Kopec, (2015)," Artificial Intelligence in the 21st Century", (2nd Edn.), Mercury Learning and Information.
- 4 Peter Jackson,(2007), "Introduction to Expert Systems", (3rd Edn), Pearson Education



Course Code	Course Name	Category	L	T	P	Credit
224IT1A4CA	SOFTWARE ENGINEERING	CORE	3	-	-	3

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts of software engineering
- Acquire knowledge on software development process
- The basics of testing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand basic software engineering	K2
CO2	Understanding software engineering models	K3
CO3	Analysis of software requirements	K1
CO4	Identify appropriate design	K2
CO5	Identify various testing strategies	K1

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	
CO2	✓	✓		✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

224IT1A4CA	SOFTWARE ENGINEERING	SEMESTER IV
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Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I Introduction to Software Engineering 06 h

Nature of Software: Defining Software-Software Application Domains-Legacy Software-The changing nature of Software: Web Apps-Mobile Applications-Cloud Computing-Product Line Software-Software Process: Process Framework-Umbrella Activities-Process Adaptation- Software Engineering Practice: Essence of practice-General Principles.

Unit II Software Process 08 h

Perspective model-Waterfall Model-Incremental Process model: The increment model-The RAD model-Evolutionary process model: Prototyping-The Spiral model-The concurrent development model.

An agile view of Process: Agility- Agile Process-Agile Process Models: Extreme Programming-Adaptive Software Development-Scrum-Agile modeling

Unit III Understanding Requirements 07 h

Requirements Engineering-Establishing the groundwork- Eliciting the requirements-Developing Use Cases-Building the analysis model-Negotiating Requirements-Requirement Monitoring-Validating Requirements-Avoiding common mistakes.

Unit IV Design Concepts 07 h

Design concepts: Abstraction-Architecture-Patterns-Modularity-Information Hiding-Functional Independence-Refinement-Aspects-Refactoring-Object Oriented Design Concepts-Design Classes-Design Model-Architectural Design.

Unit V Software Testing 08 h

A strategic Approach of Software Testing - Strategic Issues- Unit Testing- Integration testing- Validation testing- Validation-Test Criteria-Alpha and Beta testing -System Testing-Recovery Testing-Security Testing-Stress testing- Performance Testing-Deployment testing-The art of debugging- An overview of Software Testing tools.



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Text Books

- 1 Roger S.Pressman. Bruce R.Maxim, "Software Engineering A Practitioner's Approach", McGraw Hill Education, 8th Edition 2019

References

- 1 Hitesh Mohapatra, Amiya Kumar Rath, "Fundamentals of Software Engineering", BPB Publications, 2020.
- 2 Ian Sommerville, "Software Engineering", Pearson Education, 10th Edition, 2017
- 3 <https://katalon.com/resources-center/blog/automation-testing-tools>



Course Code	Course Name	Category	L	T	P	Credit
224DA1A4EP	PYTHON FOR DATA SCIENCE	EMBEDDED PRACTICAL	3	-	4	5

PREAMBLE

This course has been designed for students to learn and understand

- Concepts and process of data analysis
- Basic packages to perform scientific computing with Python
- Data visualization techniques for effective analysis

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the Python tools to perform Data Analysis	K2
CO2	Apply NumPy library to understand complex data structures	K3
CO3	Apply Pandas library to analyze, clean and explore datasets	K4
CO4	Analyze advanced features of pandas library to perform data manipulation	K2
CO5	Implement matplotlib library to visualize the data in different forms	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓	✓		
CO3	✓	✓		✓	
CO4			✓	✓	
CO5	✓	✓			

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



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B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

224DA1A4EP	PYTHON FOR DATA SCIENCE	SEMESTER IV
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Total Credits: 5

Total Instruction Hours: 84 h

Syllabus

Unit I Introduction to Data Analysis and Python 17 h

Introduction to Data Analysis: Data Analysis - Knowledge Domains of the Data Analyst - Understanding the Nature of the Data - The Data Analysis Process - Quantitative and Qualitative Data Analysis - Open Data - Introduction to the Python World: Python - The Programming Language - Data Structures - Functional programming

Practical

1. Programs using functions.
2. Programs using tuples.
3. Programs using sets.

Unit II NumPy Library 17 h

NumPy: N-dimensional array - Basic Operations - Indexing, Slicing and Iterating - Conditions and Boolean Arrays - Shape and Array Manipulation - Copies of Objects - Vectorization - Broadcasting - Structured Arrays- Reading and Writing Array Data on Files.

Practical

4. Programs using aggregate functions.
5. Programs for array manipulation.
6. Programs for reading and writing in files.

Unit III Pandas Library 17 h

Pandas Data Structures: Series - DataFrame - Index Object - Functionalities on Indexes - Operations Between Data Structures - Function Application and Mapping - Sorting and Ranking - Correlation and Covariance - Not a Number Data - Hierarchical Indexing and Leveling

Practical

7. Programs using DataFrame



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8. Programs to deal with missing values

9. Programs to find Correlation and Covariance

Unit IV Data Manipulation using Pandas 17 h

Data Preparation - Concatenating - Data Transformation - Removing Duplicates - Mapping - Discretization and Binning - Permutation - String Manipulation - Built-in Methods - Regular Expressions - Data Aggregation - Group Iteration - Advanced Data Aggregation

Practical

10. Programs to implement data transformation

11. Programs to implement string manipulation

12. Programs to implement data aggregation

Unit V Data Visualization with matplotlib 16 h

Matplotlib Architecture - pyplot - The plotting Window - Using the keyword args - Adding Elements to the Chart - Line Charts - Histograms - Bar Charts - Pie Charts - Advanced Charts

Practical

13. Programs to visualize data using Bar Charts, Pie charts

14. Programs to visualize data using Advanced Charts

15. Project using Advanced libraries

Text Books

- 1 Fabio Nelli, (2018), "Python Data Analytics with Pandas, NumPy and Matplotlib", (2nd Edn.), Apress.

References

- 1 Wes Mckinney, (2017), "Python for Data: Data Wrangling with Pandas, NumPy, and IPython", (2nd Edn.), O'Reilly
- 2 Jake VanderPlas, (2016), "Python Data Science Handbook", (1st Edn.), O'Reilly
- 3 RehanGuha, (2021) " Machine Learning Cookbook with Python ", (1st Edn.), BPB Publications.
- 4 Dipanjan Sarkar, Raghav Bali, Tushar Sharma, (2018), "Practical Machine Learning with Python", (1st Edn.), Apress



224DA1A4SP	SEC II: DATA MINING	SEMESTER IV
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Total Credits: 2
Total Instructions Hours: 48 h

S.No	Contents
1	Demonstration of Preprocessing tasks
2	Demonstrate Principal Component Analysis for a given dataset
3	Implement Apriori algorithm
4	Apply different Discretization Filters
5	Demonstrate Association Rule Mining on Stores dataset
6	Demonstrate SVM Classification
7	Demonstrate K-means Clustering
8	Demonstrate Linear Regression
9	Demonstrate Naïve Bayes Classification for Credit Risk Assessment
10	Demonstrate DBSCAN clustering
11	Implement Decision tree for products dataset
12	Implement KNN algorithm

Note: Any 10 are Mandatory.



Course Code	Course Name	Category	L	T	P	Credit
225CO1A4IA	CUSTOMER RELATIONSHIP MANAGEMENT	IDC	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- about Customer Relationship Management.
- the strategic customer acquisition and retention techniques in CRM.
- the conceptual aspects of service quality.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of Customer Relationship Management	K2
CO2	Develop the concepts and principles of CRM.	K3
CO3	Outline the need and importance of maintaining good customer relationship.	K2
CO4	Apply the knowledge of strategic customer acquisition and retention techniques in CRM.	K3
CO5	Describe the conceptual aspects of service quality.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2	✓			✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON:

<input checked="" type="checkbox"/> Skill Development	<input checked="" type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



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225CO1A4IA	CUSTOMER RELATIONSHIP MANAGEMENT	SEMESTER IV
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Understanding customers 12 h

Customer information Database – Customer Profile Analysis – Customer perception- Expectations analysis – Customer Behavior in relationship perspectives; individual and group customers- Customer life time value- Selection of Profitable customer segments.

Case study on customer behaviour.

Unit II CRM structures 8 h

Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications.

Unit III CRM Planning and Implementation 12 h

Strategic CRM planning process-Implementation issues – CRM Tools- Analytical CRM – Operational CRM – Call centre management – Role of CRM Managers – CRM Implementation Road Map- Developing a Relationship Orientation –Customer-centric Marketing Processes-Customer retention plans.

Case study on operational CRM.

Unit IV Trends in CRM 8 h

CRM Solutions – Data Warehousing – Data mining for CRM –CRM software packages – The Technological Revolution: Relationship Management-Changing Corporate Cultures.

Unit V Recognizing Customer Lifetime Value 8 h

Defining Customer Lifetime Value - Looking at Best Practices for CLV - Getting Started with Predictive Modeling - Personalizing Cross-Sells and Upsells - Enhancing Customer Loyalty and Retention: Coping with Customer Churn - Increasing Customer Retention - Operationalizing Analytics to Make Better Decisions - Growing Customer Loyalty and Advocacy

Case study on increasing customer retention.

Note:Case Studies related to the above Topics to be discussed Examined Internally.



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Text Books

- 1 Alok Kumar et al, (2015), Customer Relationship Management: Concepts and Applications, Dreamtech Press (Biztantra)
- 2 Stephanie Diamond and Mary grace Bateman, 2013 Customer Analytics For Dummies, IBM Limited Edition, John Wiley & Sons.

References

- 1 Peeru H Mohamed and A Sahadevan, (2017), Customer Relationship Management, Vikas Publishing.
- 2 Shainesh, Jagdish, N.Sheth, (2015), Customer Relationships Management Strategic Perspective, Macmillan.
- 3 Zikmund, (2021), Customer Relationship Management, Wiley.
- 4 Judith W. Kincaid, Customer Relationship Management Getting it Right, Pearson Education.

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 Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 9 th 16.10.23	AC- 16 th 13.12.23	GB- 21 st 05.01.24



Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Computer Science with Data Analytics (Students admitted during the AY 2022-23)

Course Code	Course Name	Category	L	T	P	Credit
224DA1A5CA	COMPUTER NETWORKS AND COMMUNICATION	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic taxonomy of Computer Networks
- Major features of the OSI model
- The design issues and Protocols

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the functions of each layer in OSI and TCP/IP model	K1
CO2	Understand the functions of Physical, Data Link layers paradigms and Protocols.	K2
CO3	Analyze the Network layer design issues	K4
CO4	Explain the Transport layer services	K3
CO5	Evaluate the functions of Application Layer and explain the protocols.	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2	✓	✓			✓
CO3	✓	✓	✓	✓	
CO4	✓		✓	✓	✓
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224DA1A5CA	COMPUTER NETWORKS AND COMMUNICATION	SEMESTER V
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Computer Networks 10 h

Introduction - Uses of Computer Networks - Types of Computer Networks - Network Technology form Local to Global- Example of Networks - Network Protocols - Reference models - OSI Reference: The TCP/IP Reference model - Standardization - Policy, Legal and Social issues - Case study on Network Layer Protocol

Unit II Physical and Data Link Layer 12 h

Introduction - Network Topologies - Switching - Multiplexing - Transmission Medium: Guided medium: Twisted Pair - Coaxial - fiber optics - Wireless Transmission: Electromagnetic spectrum - Radio - Transmission - Microwave Transmission - Data Link Layer: Design Issues - Error Detection and Correction - Data Link Protocols - Sliding Window protocol - Case study on Network topologies

Unit III Network Layer 12 h

Introduction : Design Issues of Network Layer - Routing - Types of routing Algorithms: Optimality Principle - Shortest path - Flooding - Distance Vector - Hierarchical Routing - Link State routing - Congestion Control - The IPV4 Protocol -IP Address: Subnets - CIDR - IPV6 - Case study on shortest path in a transport network

Unit IV Transport Layer 14 h

Introduction: Service of Transport Layer - Service Primitives : Connection Establishment - Connection Release - Error Control and Flow Control -Congestion control - UDP : Introduction - Remote Procedure Call - Real time transport protocol and control protocol- Case study on TCP-Targeted Denial of Service Attacks

Unit V Application Layer 12 h

Domain Name System : DNS Name Space - Resource Records - Name Servers - Electronic Mail: Architecture and Service - User Agents - Message Formats - Message Transfer - World Wide Web: Architecture - Static Web page - Dynamic



Web page –The Hyper Text Transfer Protocol - Case study on DNS Cache Poisoning Attacks

Text Books

- 1 Andrew S.Tanenbaum, (2022), "Computer Networks", (6th Edn.), Prentice Hall

References

- 1 Larry L.Peterson, (2011).,"Computer Networks", (5th Edn.):Morgan Kaufman
- 2 Achyut Godbole, (2009),"Data Communication and Networks", (4thEdn.): Tata Mc Graw hill
- 3 Behrouz A.Forouzan, (2011), "Data Communication and Networks", (4thEdn.): Tata Mc Graw hill



Course Code	Course Name	Category	L	T	P	Credit
224DA1A5CB	R PROGRAMMING	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Technologies related to Statistics in R
- Major features of R Programming
- Visualization and graph in R to solve problems

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the Basics of R Programming	K2
CO2	Understand the control statements, loops and functions in R Programming	K2
CO3	Construct R data objects like Data Frames, Lists, Matrices, Factors and Vectors	K3
CO4	Develop and work with the Data and use R to prepare data for analysis	K3
CO5	Visualize data with R graphics and implement statistical methods	K4

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1			✓		
CO2			✓		
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224DA1A5CB	R PROGRAMMING	SEMESTER V
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to R 10 h

Evolution of R – Features of R – Design of the R System - Limitations of R – R Resources – Interactive Mode – Batch Mode – Entering Input – R Objects – Numbers – Attributes – Vectors – Matrices – Lists – Factors –Data Frames-Data in and out of R – Dates and Times in R – Subsetting R Objects

Unit II Data Frames, Control Structures and Functions 13 h

Managing Data Frames with dplyr package- Data Frames- dplyr package- dplyr grammar Installing dplyr - functions – select - filter - arrange - rename - mutate - group by - Data Types - Variables - Constants - Operators - if- if...else - Switch – For Loops – Nested For Loops – While Loops – Repeat Loops – Next – Break – Functions: Arguments – Return Values – Functions as a Arguments : Anonymous and Properties of Functions – Argument order and Named Arguments

Unit III Data Objects in R 13 h

Scalars, Vectors, Arrays, and Matrices - Adding and Deleting Vector Elements – Length of a vector – Matrices and Array as vectors – Common vector operations - Matrices: Matrix Operations - Applying Functions to Matrix Rows and Columns - List: List Operations - Data Frames : Creating Data Frames – Merging Data Frames – Applying Functions to Data Frames - Factors : Factors and Levels – Common functions used with Factors

Unit IV Working with Data in R 12 h

Saving - Loading and Editing the Data : Entering Data – Importing data from a File – Exporting data Objects –Data Extract from CSV and Excel File - Preparing Data: Combining Data Sets – Transformation :Reassigning Variables – Transform Functions – Applying functions to each elements of an object

Unit V Data Visualization in R 12 h

R Graphics : Line Graph - Scatter Plot – Bar Charts – Pie Charts – Box Plots - Histogram - Customizing the Charts :Common Arguments to Chart Functions –



Graphical Parameters - Basic Graphic Functions : Points – Lines – Curve – Text – Title
– Legend – Box – Axis –R Statistics: Mean -Median- Mode-Linear Regression

Text Books

- 1 Joseph Adler,(2012), "R in a Nutshell", (1st Edn.), O'Reilly Media, Inc.
- 2 Roger D.Peng, (2015), "R Programming for Data Science" (1st Edn.), Lean Publishing..

References

- 1 Norman S. Matloff,(2011),"The Art of R Programming", (1st Edn.), Starch Press.
- 2 Sandip Rakshit,(2017)," R Programming For Beginners", (1st Edn.), Mc Graw Hill



Course Code	Course Name	Category	L	T	P	Credit
224DA1A5CC	BIG DATA TECHNOLOGIES	CORE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The technologies of Hadoop and Spark that form the foundations of Big Data
- The concepts of MapReduce programming to process big data
- The various approaches facilitating data analytics on huge datasets

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand about characteristics of big data and its applications	K2
CO2	Understand the working environment of Hadoop for processing data	K2
CO3	Apply NoSQL databases to process big data	K3
CO4	Analyze Spark and its uses for big data processing	K4
CO5	Design programs for big data applications using Spark components	K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224DA1A5CC	BIG DATA TECHNOLOGIES	SEMESTER V
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Big Data 10 h

Big Data: Introduction - Definition - Big Data Vs Small Data - The Five V's- Mining Big Data: Clustering - Classification - Decision Tree for Transactions - Data Visualization. Application of Big Data: Healthcare - Advertising: Pay per click advertising-Targeted advertising- Recommender Systems - Big Data in Society: Smart Vehicle-Smart Homes - Smart Cities

Unit II Big Data Analytics 12 h

Big Data Analytics: Introduction - Tools for Data Analytics - Hadoop: Features - Hadoop Architecture - Hadoop Distributed File System - MapReduce - Map Function - Shuffle and Reduce Functions - Advantages

Unit III Big Data Storage 13 h

Introduction-Moore's Law- ACID Properties- Storing Structured Data - Storing UnStructured Data: Relational Database Management Systems - NoSQL databases for big data- Types of No-SQL Databases: Document Oriented - Columnar - Graph - Key-Value Pair

Unit IV Spark 13 h

A Gentle Introduction to Spark: Spark Basic Architecture - Spark Language APIs - DataFrames- Transformations- Actions -Spark UI-Basic structured operations: Schemas- Columns and expressions- Records and Rows - DataFrame transformations. Working with Different types of Data- Aggregations - Grouping

Unit V Spark SQL 12 h

Spark SQL - Running Spark SQL Queries -Tables -Views - Databases - Complex Types-Functions - subqueries - Dataset: Actions - Transformations- Joins - Grouping and Aggregation - Resilient Distributed Datasets (RDD) -Creation - Manipulation - Transformations - Actions -Caching-Pipe RDDs to System Commands



Text Books

- 1 Dawn E. Holmes, 2017, "Big Data: A Very Short Introduction", 1st Edition, Oxford (Unit I - III)
- 2 Bill Chambers and Matei Zaharia,(2018), "Spark: The Definitive Guide", O'Reilly Media (Unit IV,V)

References

- 1 Jules.S.,Brooke Wenig,Tathagata Das& Denny Lee, (2020),"Learning Spark", O'Reilly Media.
- 2 Holden Karau & Rachel Warren, (2017),"High Performance Spark", O'Reilly Media



224DA1A5CP	CORE PRACTICAL: BIG DATA TECHNOLOGIES	SEMESTER V
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Total Credits: 2

Total Instructions Hours: 48 h

S.No	Contents
1	Implement Hadoop file management tasks like adding files and directories, retrieving files, deleting file
2	Implement the Pig Latin scripts to group and join
3	Implement the Pig Latin scripts to sort and filter data
4	Implement Hive Scripts to create, alter, drop databases and tables
5	Implement Hive Scripts to create views, functions and indexes
6	Create Resilient Distributed datasets (RDD) and perform transformations like filter and sort
7	Create RDD and perform RDD transformations like sample and Union
8	Create Spark dataframe from RDD and perform update, drop, filter functions
9	Perform pivoting in Spark dataframe
10	Load a CSV file into Spark RDD and read the contents



224DA1A5SP	SEC PRACTICAL: WEB DESIGNING	SEMESTER V
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Total Credits: 2
Total Instructions Hours: 48h

S.No	Contents
1	Create a HTML Document using Basic HTML Tags
2	Design a set of social media icons using HTML and CSS
3	Create a HTML document using a List Attributes
4	Cerate a HTML document to display a class time table using <table> tag
5	Create a HTML document to display Mouse over effect on image using CSS
6	Create an animated search bar that glows when focused using java script
7	Create a web page containing a clock using java script
8	Create a web page to display an order form using Java Script and DHTML
9	Create a CGPA Calculator in Web Browser using HTML, CSS, Java Script
10	Create a dynamic to-do list where users can add, edit, and delete tasks using PHP
11	Create a file and write into the data in file using PHP
12	Create a file and upload using PHP and script



Course Code	Course Name	Category	L	T	P	Credit
224DA1A5DA	CLOUD COMPUTING	DSE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Basic Concepts of Cloud Computing and Services
- Cloud Computing Architectures, Applications and Challenges
- Cloud Storages and Explore File Sharing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the Fundamentals of Cloud and its working Environment	K1
CO2	Identify the usage of cloud	K2
CO3	Understand Cloud Services	K3
CO4	Illustrate the concepts of Storage and Sharing with Communities	K5
CO5	Evaluate Web based Communication Tools in cloud	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓			
CO2	✓	✓		✓	
CO3	✓	✓		✓	
CO4	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224DA1A5DA	CLOUD COMPUTING	SEMESTER V
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction 12 h

Cloud Computing: Introduction - From Collaboration to Cloud - Working of Cloud Computing - Advantages and Disadvantages - Benefits - Developing Cloud Services: Web Based Applications - The Pros and Cons of Cloud Service Development - Discovering Cloud Services and Tools

Unit II Cloud Computing Usage 12 h

Centralizing Email Communications - Cloud Computing for Community - Collaborating on Schedules - Collaborating on Group Projects and Events - Cloud Computing for Corporation - Managing the contact lists - Managing Projects - Collaborating on Reports - Collaborating on Presentations

Unit III Cloud Services 12 h

Collaborating on Calendars, Schedules and Task Management: Exploring Online Schedules Application - Exploring Online Planning and Task Management - Collaborating on Event Management - Collaborating on Project Management - Collaborating on Word Processing - Spreadsheets

Unit IV Storing and Sharing 12 h

Understanding Cloud Storage: Risks of Storing Data in the clouds - Evaluating Online File Storage and Sharing Services - Exploring online Bookmarking Services - Exploring Online Photo Editing Applications - Exploring Photo Sharing Communities - Controlling it with Web Based Desktops

Unit V Web based Communication Tools in cloud 12 h

Evaluating Web Mail Services - Evaluating Instant Messaging - Evaluating Web Conference Tools - Creating Groups on Social Networks: Creating Groups on Social Networks - Evaluating Online Groupware - Collaborating via Blogs and Wikis



Text Books

- 1 Michael Miller, 2014, "Cloud Computing", Pearson Education, New Delhi.

References

- 1 Arshdeep Bahga, 2013, "Cloud Computing: A Hands-On Approach Paperback – Import
- 2 Anthony T. Velte, 2009, "Cloud Computing A Practical Approach", (1st Edn.), Tata McGraw Hill Education Private Limited



Course Code	Course Name	Category	L	T	P	Credit
224DA1A5DB	PARALLEL AND DISTRIBUTED COMPUTING	DSE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Parallel computing architecture, programming models and algorithms
- Distributed Database architecture and middleware
- Modern computing architecture, security and applications

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Provide a comprehensive understanding of parallel and distributed computing	K2
CO2	Develop proficiency in a diverse range of parallel computing algorithms and techniques	K3
CO3	Explore the principles and technologies of parallel and distributed databases	K4
CO4	Gain comprehensive knowledge of grid, cluster, high-performance, mobile, wireless computing, and internet computing technologies	K3
CO5	Develop proficiency in performance evaluation, fault tolerance, security, and diverse application domains of parallel and distributed computing	K5

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓		
CO4	✓	✓	✓		
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



224DA1A5DB	PARALLEL AND DISTRIBUTED COMPUTING	SEMESTER V
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction to Parallel and Distributed Computing 12 h

Introduction: Historical Overview, Motivation and Challenges, Taxonomy of Parallel and Distributed Systems - Parallel Computer Architectures: Flynn's Taxonomy, Shared Memory vs. Distributed Memory Architectures, SIMD and MIMD Architectures, Memory Hierarchy - Parallel Programming Models and Paradigms: Shared Memory Programming (OpenMP, Pthreads), Message Passing (MPI), Data Parallelism (CUDA, OpenCL), Task Parallelism (Task-based models like Intel TBB)

Unit II Parallel Computing Algorithms and Systems 12 h

Parallel Sorting Algorithms: Parallel Merge Sort, Parallel Quick Sort - Graph Algorithms: Parallel BFS, Parallel Shortest Paths - Parallel Matrix Operations, Matrix Multiplication, LU Decomposition - Computational Geometry Algorithms - Parallel Languages and Compilers - Parallel and Distributed Operating Systems: Process and Thread Management, Scheduling Algorithms for Parallel Systems, Distributed File Systems

Unit III Distributed Computing Paradigms 12 h

Parallel and Distributed Databases: Distributed Database Architectures, Data Replication and Partitioning, Distributed Query Processing and Optimization - Distributed Systems and Middleware: Remote Procedure Calls (RPC), Message-Oriented Middleware (e.g., JMS), Distributed Object Models (CORBA, DCOM) - Cloud Computing and Big Data Technologies - Peer-to-Peer Computing: P2P Overlay Networks, Distributed Hash Tables (DHTs), P2P File Sharing Systems

Unit IV Modern Computing Architectures 12 h

Grid and Cluster Computing: Grid Computing Architectures and Middleware, High-Performance Computing on Clusters, Job Scheduling and Resource Management - High-Performance Computing and Supercomputing - Mobile and Wireless Computing - Internet Computing and Web Services: Web Server Architectures, Web Services and Service-Oriented Architectures, RESTful APIs and Web Service Security



Unit V Performance, Security, and Applications

12 h

Performance Evaluation and Benchmarking: Metrics for Performance Evaluation, Benchmarking Methodologies, Performance Tuning Techniques - Fault Tolerance, Reliability, and Availability - Security and Privacy in Parallel and Distributed Systems - Applications of Parallel and Distributed Computing: Scientific Computing Applications, Big Data Analytics, Internet of Things (IoT) Applications

Text Books

- 1 Parallel and Distributed Computing Handbook, Albert Y. Zomaya, second edition, 2017, Chapman and Hall/CRC
- 2 Distributed Systems: Principles and Paradigms, Andrew S. Tanenbaum and Maarten Van Steen, third edition, 2017, Pearson

References

- 1 Parallel Programming: Concepts and Practice by Michael McCool, James Reinders, and Arch Robison, 2nd Edition, 2019, Morgan Kaufmann Publishers
- 2 Distributed Computing: Principles, Algorithms, and Systems by Ajay D. Kshemkalyani and Mukesh Singhal, second edition, 2011, Cambridge University Press



Course Code	Course Name	Category	L	T	P	Credit
224DA1A5DC	TEXT ANALYTICS	DSE	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- The tools and techniques for performing text analytics
- Similarity and dissimilarity measures in text processing
- Text computing methods in chatbot application.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of text processing	K2
CO2	Apply preprocessing methods such as stemming and tokenization	K4
CO3	Evaluate classification models to classify text	K3
CO4	Determine the text similarity using different measures	K3
CO5	Understand the fundamentals of conversation in chatbots	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5					✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/>	Skill Development	<input type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input type="checkbox"/>	Innovations
<input type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics

224DA1A5DC	TEXT ANALYTICS	SEMESTER V
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Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Natural Language Basics 11 h

Natural Language - Language Syntax and Structure - Words - Phrases - Clauses - Grammar - Word Order Typology - Language Semantics - Natural Language Processing - Machine Translation - Speech Recognition Systems - Questioning Answering Systems - Contextual Recognition and Resolution - Text Summarization - Text Categorization.

Unit II Processing and Understanding Text 13 h

Text Tokenization - Sentence Tokenization - Word Tokenization - Text Normalization - Cleaning - Tokenizing - Removing Special Characters - Case Conversions - Removing Stopwords - Correcting Words - Stemming - Lemmatization - Understanding Text Syntax and Structure.

Unit III Text Classification 13 h

Text Classification - Text Normalization - Feature Extraction - Classification Algorithms - Naïve Bayes - Support Vector Machine - Evaluating Classification Models - Building a Multi-class Classification System - Applications and Uses.

Unit IV Text Similarity and Clustering 13 h

Information Retrieval - Feature Engineering - Similarity Measures - Unsupervised Machine Learning Algorithms - Analyzing Term Similarity - Hamming distance - Manhattan Distance - Euclidean Distance - Analyzing Document Similarity - Cosine Similarity - Document Clustering - K- Means Clustering.

Unit V Chatbots 10 h

Chatbots - Fundamentals of Conversation - Rules for Polite Conversation - Greetings and Salutations - Handling Miscommunication - Entertaining Questions - Dependency Parsing - Constituency Parsing - Question Detection



Text Books

- 1 Dipanjan Sarkar, 2016, Text Analysis with Python: A Practical Real-World Approach to gaining Actionable Insights from your Data, Apress.(Unit I-IV)
- 2 Benjamin Bengfort, Rebecca Bilbro ,2018, Tony Ojeda. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, O'REILY (Unit -V)

References

- 1 Jurafsky, D. and J. H. Martin,2021, Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (3rd Draft).
- 2 John Atkinson-Abutridy, 2022,Text Analytics: An Introduction to the Science and Applications of Unstructured Information Analysis, CRC Press.



224DA1A5GA	DATA VISUALIZATION	SEMESTER V
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Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Communicating Data 5 h

Introduction- A Step in the process - A Model of Communication - Three Types of Communication Problems - Six Principles of Communicating Data - Handling Data

Unit II Gathering data 4 h

Finding sources- Data scraping- Formatting Data: Data formats- Formatting tools - Formatting with code. Case Study: Web Scraping for Sentiment Analysis.]

Unit III Ratios and Proportions 5 h

Ratios – Rates: Blending Data Source - Visualizing Rates - Proportions and Percentages: Introduction Filters and Quick Filters - Introducing Table Calculations

Unit IV Multiple Quantities 5 h

Scatterplots - Stacked Bars - Regression and Trend Lines - The Quadrant Charts Case Study : Stock Market Data Analytics

Unit V Dashboards 5 h

Dashboards - Types of Dashboards - Building and Exploratory Dashboards - Advanced Dashboards Features: Animating Dashboards




Text Books

- 1 Ben Jones, 2014, "Communication Data with Tableau", First Edition, O'Reilly Media (Unit I-III).
- 2 Nathan Yau, 2011, "Visualize This : The Flowing Data guide to Design , Visualization and Statistics", First Edition Wiley (Unit IV-V).

References

- 1 Steve Wexler , Jeffrey Shaffer, et al, 2017, "The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios", Wiley
- 2 Cole Nussbaumer Knafllic, 2015, " Storytelling with Data: A Data Visualization Guide for Business Professionals", John Wiley & Sons
- 3 Few, Stephen, 2012, "Show Me the Numbers. Designing Tables and Graphs to Enlighten", Second Edition, Analytics Press
- 4 Stephen Few, 2019, "The Data Loom: Weaving Understanding by Thinking Critically and Scientifically with Data", Analytics Press

Dr. N. G. P.
24/4/24
 BoS Chairman
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APPROVED		
BoS- 10 th 2.4.24	AC - 17 th 17.4.24	GB -



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6CA	NEXT GENERATION DATABASES	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Concepts of NoSQL Databases
- types of NoSQL databases
- features of MongoDB

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the features of advanced databases	K1
CO2	Develop programs using Document and Graph databases	K3
CO3	Implement operations of column and key value databases	K3
CO4	Construct simple queries using MongoDB	K3
CO5	Apply advanced MongoDB features	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1		✓	✓		
CO2		✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6CA	NEXT GENERATION DATABASES	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 8 h

Database revolutions: First, second and third generation - Big Data Revolution - Scaling web 2.0 : Sharding, CAP Theorem - Databases of Future: Consistent Models, Schema, Database Languages, Storage, Data Format:JSON,BSON - Convergent Databases - Disruptive Database Technologies - NoSQL databases- NoSQL APIs

Unit II Document and Graph Databases 8 h

Document databases : Introduction - XML and XML Databases : XML Tools and Standards, XML Databases, XML support in relational systems - JSON Document Databases: JSON and Ajax - JSON Databases-Data Models in Document Databases - MemBase and CouchBase -Graph Databases: Introduction - RDBMS patterns for Graphs -Property Graphs and Neo4j - Gremlin - Graph Database Internals -Graph Compute Engines

Unit III Column and Key-Value Databases 10 h

Introduction – Data Warehousing Schemas- The Columnar Alternative- Column Database Architectures- In-Memory Databases - Distributed Database Patterns:Distributed Relational Databases- Non-Relational Distributed Databases- Cassandra - HBase- Amazon Dynamo

Unit IV MongoDB 10 h

Introduction to MongoDB: Need for MongoDB - MongoDB Vs Relational Database Management Systems - MongoDB Sharding and Replication - Data Types - MongoDB Query Language - Getting Data into MongoDB - Database Operations: Create - Update - Read - Delete - Querying

Unit V Advanced MongoDB 12 h

Indexing - Aggregation – Introduction to Map-Reduce Programming: Mapper - Reducer- Combiner – Partitioner - Searching – Sorting – Compression – Sharding- Comparing Relational databases with NoSQL stores



Text Books

- 1 Guy Harrison, 2015, "Next Generation Databases", 1st Edition, Apress.
- 2 Shakuntala Gupta Edward, Navin Sabharwal, "Practical MongoDB", 1st Edition, Apress.

References

- 1 Adam Fowler, 2015, "NoSQL for Dummies", 1st Edition, John Wiley & Sons
- 2 Ramez Elmasri and Shamkant Navathe, 2011, "Fundamentals of Database Systems", 6th Edition, Pearson



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6CB	PRINCIPLES OF MACHINE LEARNING	CORE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Fundamentals of Machine Learning
- Supervised and Unsupervised Learning algorithms used for Classification, Regression and Clustering
- Concepts Of Neural Networks

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of Machine Learning and data pre-processing	K2
CO2	Identify and evaluate the performance of a machine learning model for an application	K1
CO3	Implement classification and regression algorithms for various tasks	K3
CO4	Apply various clustering algorithms to group the data	K3
CO5	Understand the principles, architecture and types of neural networks	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓
CO2	✓	✓	✓		✓
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6CB	PRINCIPLES OF MACHINE LEARNING	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Machine Learning 9 h

Introduction - Types of Machine Learning: Supervised, Unsupervised and Reinforcement - Applications - Activities- Types of Data - Exploring Structure of Data- Data quality and Remediation- Data Pre-Processing - Quantum Computing: Benefits -States of a Quantum system, Measurement, Operations

Unit II Feature Engineering, Modeling and Evaluation 10 h

Feature Transformation - Feature Subset Selection - Selecting a model - Training a model : Hold out method - K fold Cross validation Method - Model Representation and Interpretability - Evaluating Performance of the model - Improving Model Performance

Unit III Supervised Learning: Classification, Regression 11 h

Introduction to Supervised learning - Classification Model - Classification learning steps: k - Nearest Neighbour - Decision Trees -Random Forest Model - Support Vector Machines- Regression: Introduction - Types: Simple Linear Regression, Multiple, Linear, Logistic Regression

Unit IV Unsupervised Learning: Clustering, Association Rules 10 h

Supervised Vs Unsupervised learning- Applications of Unsupervised learning - Clustering: Types of Clustering - Partitioning methods- K-Medoids - Hierarchical Clustering - DBSCAN -Finding patterns using Association rule: Association rule - Apriori algorithm

Unit V Neural Networks 8 h

Introduction - Applications -Neural Model: Single-Input - Transfer Functions - Multiple Input Neuron - Network Architecture - Layers of Neuron - Perceptron: Hamming Network: Feed forward Layer - Recurrent Layer - Hopfield Network - Perceptron Learning Rule - CNN, RNN



Text Books

- 1 Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, 2023, "Machine Learning", 13st Edition, Pearson Publishers.
- 2 Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, Orlando De Jesus 2014," Neural Network Design",2nd Edition, Martin Hagan

References

- 1 Tom M. Mitchell, 2017, "Machine Learning, Tata McGraw-Hill.
- 2 Suresh Samudrala, 2019, "Demystifying Machine Learning, Neural Networks and Deep learning", 1st Edition, Notion Press.
- 3 Phillip Kaye, Raymond Laflamme,2007,"An introduction to Quantum Computing", Oxford University press



224DA1A6SP	SEC PRACTICAL:DATA VISUALIZATION	SEMESTER VI
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Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Construct a tree map, create appropriate hierarchical views and explore the data.
2	Construct an Excel file and create a bar chart version showing the same hierarchy as the tree map, coloring it to emphasize similar results.
3	Create a dashboard to find insights that improve employee recruitment, satisfaction and retention.
4	Create visualization to show the Pareto chart analysis.
5	Make a visualization showing the largest number of profits in product category.
6	Create visualization to show the most calls at a specific time block.
7	Create visualization using grouping and subgrouping functions.
8	Make a visualization that enables to identify the best employee of the month.
9	Visualize the product usage patterns and trends.
10	Make a dashboard that allows online sellers to keep track of key metrics for optimizing their online store.



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6DA	PRINCIPLES OF INTERNET OF THINGS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- various IoT architectures
- IoT Data Analytics and privacy issues in IoT networks
- Domain specific applications of IoT

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of IoT	K2
CO2	Understand IoT Architectures and the functional stack	K2
CO3	Identify the devices to collect and integrate data from IoT networks	K1
CO4	Apply data analytics techniques to IoT data and identify the security issues	K3
CO5	Apply IoT infrastructure for real time applications	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1			✓		
CO2		✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6DA	PRINCIPLES OF INTERNET OF THINGS	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Introduction of IoT -Genesis of IoT - IoT and Digitization - IoT Impact - Convergence of IT and OT - IoT Challenges - IoT Network Architecture and Design - Scale - Security - Constrained Devices and Networks - Data - Legacy Device Support

Unit II Architectures 10 h

IoT Architectures: Machine to Machine (M2M) - IoT Standardized Architecture -IoT World Forum (IoTWF) Standardized Architecture - Core IoT Functional Stack -IoT Network management Sub layer - IoT Data Management and Functional Stack - Fog computing - Edge Computing

Unit III Smart Objects in IoT 10 h

Sensors - Actuators - Smart Objects: Definition - Trends in Smart Objects - Sensor Network: Wireless Sensor Networks. Connecting smart objects: Communications Criteria - Range - Frequency - Power Consumption- Topology - Constrained Devices - Constrained Node Networks - Data rate, Throughput, Latency

Unit IV Data Analytics for IoT and Security 10 h

Introduction: Structured Versus Unstructured Data - Data in Motion Versus Data at Rest - IoT Data Analytics - IoT Data Analytics Challenges - Security : Security Frameworks for IoT - Privacy in IoT networks - IoT Characteristics and reliability - Addressing reliability

Unit V Applications 8 h

Introduction : Sensors - The Gateway: Hardware - Software - Internet of Vehicles(IoV) : Basics of IoV - Characteristics and Challenges - Enabling Technologies - Cloud Based Smart facilities and Management - Architecture for smart facility management -Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle - Case Study



Text Books

- David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, 2017, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press
- 1
- 2
- Rajkumar Buyya and Amir Vahid Dastjerid ,2016, "Internet of Things Principles and Paradigms", Morgan Kaufmann ,Elsevier

References

- 1 Arshdeep Bahga, Vijay Madisetti, 2015, "Internet of Things – A hands-on approach", Universities Press
- 2 Olivier Hersent, David Boswarthick, Omar Elloumi, 2012, "The Internet of Things – Key applications and Protocols", Wiley



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6DB	FOUNDATIONS OF DEEP LEARNING	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Fundamental deep learning concepts, regularization and optimization.
- Convolutional Neural Network and Recurrent Neural Network models
- Graph Neural Networks and its framework .

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the foundational concepts of neural networks	K2
CO2	Implement various optimization and regularization techniques in deep learning models	K3
CO3	Apply convolutional neural networks to address challenges in fields such as image recognition.	K3
CO4	Understand the various Recurrent Neural Network models	K3
CO5	Demonstrate techniques to process data using graph neural networks	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1			✓	✓	
CO2			✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6DB	FOUNDATIONS OF DEEP LEARNING	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I An Introduction to Neural Networks 10 h

Introduction - Single Computational Layer - The Base Components of Neural Architectures - The Importance of Nonlinearity - Advanced Architectures and Structured Data - Backpropagation in Computational Graphs - Backpropagation in Neural Networks - The Vector-Centric View of Backpropagation - Tuning and Preprocessing

Unit II Regularization and Optimization 10 h

Parameter Norm Penalties - Norm Penalties as Constrained Optimization - Regularization and Under-Constrained Problems - Dataset Augmentation - Noise Robustness - Early Stopping - Dropout - Optimization: Learning Vs Pure Optimization - Challenges in Neural Network Optimization

Unit III Convolutional Neural Networks 10 h

Introduction- The Basic Structure of a Convolutional Network: Padding - Strides - The ReLU Layer - Pooling - Fully Connected Layers - The Interleaving between Layers - Hierarchical Feature Engineering - Training a Convolutional Network - Backpropagating Through Convolutions - Convolution/Backpropagation as Matrix Multiplications - Data Augmentation - Case study

Unit IV Recurrent Neural Networks 10 h

Introduction - The Architecture of Recurrent Neural Networks - Language Modeling Example of RNN - Backpropagation Through Time - Bidirectional Recurrent Networks - Multilayer Recurrent Networks - Echo-State Networks - Long Short-Term Memory (LSTM) - Gated Recurrent Units (GRUs)

Unit V Graph Neural Networks 8 h

Graph Neural Networks: The General Framework -The Neighborhood Function - Graph Convolution Function - GraphSAGE- Handling Edge Weights - Handling



New Vertices - Handling Relational Networks - Directed Graphs - Gated Graph Neural Networks - Comparison with Image Convolutional Networks - Backpropagation in Graph Neural Networks

Text Books

- 1 Charu Aggarwal, 2023," Neural Networks and Deep Learning: A Textbook ", 1st Edition, Springer
- 2 Ian Goodfellow, Yoshua Bengio, and Aaron Courville, 2016,"Deep Learning",1st Edition, MIT Press

References

- 1 Bishop, Christopher M,2006,"Pattern Recognition and Machine Learning". 1st Edition, Springer
- 2 Chollet, François,2017,"Deep Learning with Python",1st Edition, Manning Publications



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6DC	WEB ANALYTICS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Web analytics fundamentals and concepts
- Clickstream analysis, Website Testing methods, Segmentation analysis
- The role of emerging analytics in social, mobile and video domains.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the techniques and foundations of web data analytics	K2
CO2	Identify the strategies and challenges of Clickstream analysis	K2
CO3	Apply techniques to measure the success of websites	K3
CO4	Summarize the various testing methods and segmentation analysis	K2
CO5	Interpret the role of emerging analytics in social, mobile and video domains	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6DC	WEB ANALYTICS	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48h

Syllabus

Unit I Web Analytics Basics 9 h

Introduction: Web Analytics 2.0 - Clickstream- Multiple outcome analysis- Experimentation and testing- Voice of customer - Competitive intelligence - The tactical shift - Optimal strategy for choosing web analytics

Unit II Clickstream analysis 9 h

Clickstream analysis: Metrics - Eight critical web metrics - Web metrics demystified -Strategically aligned tactics for impactful web -Web analytics report - Foundational analytical strategies - Clickstream analysis made actionable - Challenges

Unit III Qualitative Data 10 h

Measuring Success-Actionable Outcome KPIs - Moving beyond conversion rates- Micro and macro conversion-Measuring success for a non - ecommerce website - Leveraging qualitative data: Surveys- Web enabled emerging user research options

Unit IV Testing and Segmentation Analysis 10 h

A/B Testing - Multivariate testing - Actionable testing ideas - Controlled experiments - Competitive intelligence (CI) Analysis - CI data source - Types - Secrets-Website Traffic Analysis- Search and keyword analysis - Audience identification and Segmentation analysis

Unit V Emerging analytics 10 h

Social, mobile, video: Measuring social web - The data challenge - Analyzing mobile customer experiences-Measuring the success of blogs - Quantifying the impact of Twitter - Analyzing the performance of videos - Case Study: Advanced Content Personalization and Engagement



Text Books

- 1 Avinash Kaushik, 2010, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, 1st Edition, Wiley Publishing.

References

- 1 Bing Liu, 2012, "Sentiment Analysis and opinion mining", Morgan and claypool Publishing.
- 2 Eric Enge, Stephan Spencer, Jessie Stricchiola, 2005, "The Art of SEO:Mastering Search Engine Optimization", 3rd Edition, O'Reilly..
- 3 Dietmar Jannach, Markus Zanker, 2011, Recommender system-An Introduction, Cambridge University Press.



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6DD	EDGE COMPUTING AND ANALYTICS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Edge Computing concepts and architecture
- Edge Computing Techniques needed to perform data processing and analytics
- Protocol, Security and Privacy issues in edge computing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts and architecture of Edge Computing	K2
CO2	Interpret the varieties of devices and sensors needed for Edge Computing	K2
CO3	Implement edge computing for data processing and analytics	K3
CO4	Summarize the security and privacy issues related to the area of edge computing.	K2
CO5	Apply the Edge Computing concepts and components for cloud Interfacing	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6DD	EDGE COMPUTING AND ANALYTICS	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Edge Computing 9 h

Edge Computing Definition: Introduction to Edge Computing Scenario - Edge computing purpose and definition - Edge computing use cases-Hardware architectures-Platforms-Edge vs Fog Computing-Communication Models - Edge, Fog and M2M Models.

Unit II Edge computing essentials 9 h

Introduction- Edge Devices- Edge Server Cluster- Cloud Server - Background Essentials: IoT Devices- Mobile Phone-Based Sensors- Medical Sensors- Neural Sensors- Environmental and Chemical Sensor- Edge Computing Simulators- Edge Cloud Sim

Unit III Edge Data Analytics 10 h

Types of Data Analytics- Edge Data Analytics- Machine Learning-Model Building - Performance Evaluation -Potential of Edge Analytics- Machine Learning for Edge Devices- Edge Analytics: Case Study

Unit IV Edge Data security 10 h

Data Security - Data Confidentiality- Identity-Based Encryption- Attribute-Based Encryption- Authentication- Single-Domain Authentication- Cross-Domain Authentication- Handover Authentication. Privacy-Preserving Schemes: Data Privacy- Location Privacy- Identity Privacy- Edge-Based Attack Detection and Prevention.

Unit V Edge to Cloud interfacing 10 h

Implementation of Microcomputer and device Interfacing- Edge to Cloud Protocols - MQTT: Overview - publish - subscribe- Architecture details - state transitions- packet structure- data types - communication formats - MQTT 3.1.1 working example - Industrial, Commercial IoT and Edge - Edge computing and solutions.



Text Books

- 1 Anitha Kumari, G.Sadha Sivam, D.Dharani and M.Niranjanmurthy, 2022,"Edge Computing Fundamentals ,Advances and Applications" ,1st Edition,CRC Press
- 2 Perry Lea, 2020," IoT and Edge Computing for Architects"2nd Edition, Packt Publishing.

References

- 1 Rajkumar Buyya, Satish Narayana Srirama, 2019," Fog and Edge Computing: Principles and Paradigms", Wiley publication
- 2 David Jensen, 2019, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge",1st Edition, Apress.
- 3 Simon Monk,2019," Raspberry Pi Cookbook", 3rd Edition, O'Reilly Media, Inc.,



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6DE	DATA PRIVACY AND SECURITY	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Security in computer systems to protect information and Resist Attacks
- A Comprehensive overview of the different facets of Information Security
- Types of Ciphers and Digital Certificates

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the role of Information Security in an organization	K2
CO2	Illustrate risk management process handled in the organization with business continuity planning	K3
CO3	Interpret secure techniques like authentication, firewall and its types	K2
CO4	Apply various types of ciphers and encipherment techniques	K3
CO5	Apply the concept of digital certificates	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human values/ Ethics



224DA1A6DE	DATA PRIVACY AND SECURITY	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Information Security 9 h

Introduction - History of Information Security- Security - Components of an Information System - Balancing Information Security and Access- The Systems Development Life Cycle - The Security Systems Development Life Cycle - Security Professionals and Organization-Communities of Interest

Unit II Risk Management 9 h

Introduction - Risk Identification: Planning and Organizing the Process - Assets Identifying and Inventorying - Classifying and Prioritizing Information Assets - Identifying and Prioritizing Threats - Vulnerability Identification - Risk Assessment- Risk Control: Strategies - Selecting Risk Control Strategies - Quantitative versus Qualitative Risk Control Strategies-Risk Management

Unit III Security Technology: Access Controls, Firewalls and VPNs 10 h

Introduction-Access Control:Identification-Authentication-Authorization-Accountability -Firewalls: Firewall processing modes-firewalls categorized by Generation and Structure-Firewall Architecture-Managing and Controlling Firewalls-- Application Layer Proxy Firewalls- Media Access Control Firewalls - Hybrid firewalls Architecture - Selecting the Right Firewall -Protecting Remote Connections: Virtual Private Networks

Unit IV Cryptography Techniques 10 h

Introduction: Plain Text and Cipher Text - Substitution Techniques - Transposition Techniques - Encryption and Decryption - Symmetric and Asymmetric Key Cryptography - Steganography, Possible Types of Attacks

Unit V Public Key Infrastructure 10 h

Digital Certificates: Introduction - The Concept of Digital Certificates - Certification Authority (CA), Technical details of digital Certificate - Digital Certificate Creation - Trust Digital Certificates - Certificate Hierarchies and Self - Signed Digital Certificates - Certificate Types Private Key Management- The PRIX Model - Public Key Cryptography Standards (PKCS)



Text Books

- 1 Michael E Whitman and Herbert J Mattord, 2019, "Principles of Information Security", 6th Edition, Course Technology, Cengage Learning.
- 2 Atul Kahate, 2006, "Cryptography and Network Security", 4th Edition, Tata McGraw Hill

References

- 1 William Stallings, "Cryptography and Network Security: Principles and Practice", 6th Edition, Pearson Education.
- 2 John R Vacca ,2013," Computer and Information Security Handbooks", 2nd Edition, Elsevier.



Course Code	Course Name	Category	L	T	P	Credit
224DA1A6DF	SOCIAL MEDIA ANALYTICS	DSE	4	-	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Concepts and framework for Social Media analytics
- Tools and techniques for visualizing Social Media data
- Behavior of users in social network communities and repositories

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the foundations of Social Media analytics	K2
CO2	Outline the Components and tools used in Social Media analytics	K2
CO3	Demonstrate Social Media Dashboards, Metrics and Reports	K3
CO4	Interpret the behavior of user in social network communities	K2
CO5	Apply techniques for accessing and analyzing the social network repositories	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1			✓		✓
CO2			✓		
CO3	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

COURSE FOCUSES ON

<input checked="" type="checkbox"/> Skill Development	<input type="checkbox"/> Entrepreneurial Development
<input checked="" type="checkbox"/> Employability	<input type="checkbox"/> Innovations
<input type="checkbox"/> Intellectual Property Rights	<input type="checkbox"/> Gender Sensitization
<input type="checkbox"/> Social Awareness/ Environment	<input type="checkbox"/> Constitutional Rights/ Human Values/ Ethics



224DA1A6DF	SOCIAL MEDIA ANALYTICS	SEMESTER VI
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Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Social Media Data 9 h

Foundation of Analytics – Evolution of Data - Social Media Data Sources: Offline and Online – Defining Social Media Data – Data Sources into Social Media Channels – Estimated Vs Factual Data Sources – Public and Private Data – Data Gathering in Social Media Analytics – Application Programming Interface – Web Scraping or Crawling

Unit II Analytics in Social Media 10 h

Types of Analytics in Social Media – Social Media Listening: Keywords and Mention based Analysis – Advertising Analytics – Content Management Systems Analytics – Customer Relationship Management Analytics – Dedicated Vs Hybrid Tools – Advantages of Dedicated Tools -Hybrid Tools: Dedicated Tools with Hybrid Features – Advantages and Disadvantages of Hybrid Tools – Data Integration Tools

Case Study: Social Media Campaign Analysis

Unit III Metrics , Dashboards and Reports 10 h

Default and Custom metrics – Metric Categories : Divide and Conquer – Graph Types – Metrics and Strategy – Dealing with Complex and Subjective questions – Metric and Tactics – Dashboards: Defining Dashboard Objectives – Default Vs Custom Dashboards – Data integration Dashboard – Reports: Elements of Reporting – Element as Chain-Reporting Approaches – Goal Oriented -Story Telling Animation Effects in reporting - Reporting with Team

Unit IV Analyzing the Social Network 10 h

Accessing the Facebook: Understanding the Graph API – Understanding the Netvizz – Data Access Challenge – Analyzing the Personal Social Network: Basic Descriptive Statistics – Analyzing the Mutual Interests – Build the friend network graph – Analyzing the Node Properties -Analyzing the network communities

Unit V Social Coding with GitHub 9 h

Environment Setup – Understanding the GitHub – Accessing GitHub Data – Registering an application in GitHub- Accessing the Data using the GitHub API – Analysis of the repository Activities : Analyzing weekly commit frequency –



Analyzing commit frequency distribution versus day of the week – Daily commit frequency – weekly code modification history – trending repository

Text Books

- 1 Alex GonCalves, 2017, "Social Media Analytics Strategy Using Data to Optimize Business Performance", 1st Edition, Apress
- 2 Raghav Bali, Dipanjan Sarkar, Tushar Sharma, 2017, "Learning Social Media Analytics with R", 1st Edition, Packt Publisher

References

- 1 Marshall Sponder, 2012, "Social Media Analytics Effective Tools for Building Interpreting and using Metrics", Tata Mc Graw Hill
- 2 Tracy L. Tuten, Michael R. Solomon, 2018, "Social Media Marketing", Sage
- 3 Gohar F. Khan, 2018, "Creating Value With Social Media Analytics", 1st Edition, CreateSpace Independent Publishing
- 4 Mathew Ganis, Avinash Koikrkar, 2015, "Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media", IBM Press

Course Code	Course Name	Category	L	T	P	Credit
223BC1A6AA	INNOVATION, IPR AND ENTREPRENEURSHIP	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- The role of Entrepreneurship in Economic Development and basics of Intellectual Property Rights, Copy Right Laws, Trade Marks and Patents
- ethical and professional aspects related to intellectual property law context
- Intellectual Property (IP) as an career option

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of innovation, IPR, entrepreneurship and its role in economic development	K2
CO2	Know the value, purpose and process of Patent	K2
CO3	Understand the basics of trademarks and industrial designs	K2
CO4	Acquire knowledge about copyright and copyright law	K2
CO5	Identify Geographical Indications	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1					✓
CO2					✓
CO3					✓
CO4					✓
CO5					✓

COURSE FOCUSES ON

<input type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input checked="" type="checkbox"/>	Intellectual Property Rights	<input type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human values/ Eth

223BC1A6AA	INNOVATION, IPR AND ENTREPRENEURSHIP	SEMESTER VI
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Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I Introduction to Innovation and Entrepreneurship 05 h

Meaning of Creativity, Invention and innovation - Types of Innovation - Introduction and the need for Intellectual Property Right (IPR) - Kinds of IPR - National and International IPR Policy. Entrepreneurs-Concept, characteristics, Functions, need and types, Entrepreneurial decision process. Role of Entrepreneurship in Economic Development.

Case Study: Jayabharati Viswanath: A case of Ladel to Leather.

Unit II Patents 05 h

Introduction and origin of Patent System in India- Conceptual Principles of Patent Law in India - Process for obtaining patent - Rights granted to a Patentee -Validity of patent- Infringement of Patent.

Case Study: Apple Inc. v. Samsung Electronics Co. Ltd. (2020)

Unit III Trademarks 05 h

Origin of Trade Marks System - Types - Functions - Distinctiveness and Trademarks - Meaning of Good Trademark - Rights granted by Registration of Trademarks - Infringement of trademark.

Case Study: Merck v. Mylan Pharmaceuticals (2016)

Unit IV Copyright 05 h

Introduction and Evolution of Copyright - Objectives and fundamentals of Copyright Law - Requirements for Copyrights - Works protectable under Copyrights - Authorship and Ownership - Rights of Authors and Copyright owners - Infringement of Copyright.

Case Study: J.K. Rowling and Warner Bros. v. Steve Vander Ark (2007)

Unit V Geographical Indications 04 h

Introduction and Concept of Geographical Indications - History - Administrative Mechanism - Benefits of Geographical Indications - Infringement of registered Geographical Indication



Case Study: Darjeeling Tea v. Tea Board of India (2012)

Note: Case studies related to the above topics to be discussed (Examined internal only)


Text Books

- 1 Nithyananda, K V. 2019, "Intellectual Property Rights" Protection and Management. Cengage Learning India Private Limited, New Delhi, India.
- 2 Dr.S.S.Khanka, 2020,"Entrepreneurial Development", S Chand and Company Limited, New Delhi, India.

References

- 1 Ahuja, V K. 2017, "Law relating to Intellectual Property Rights", 3rd Edition, Lexis Nexis, Gurgaon, India.
- 2 Neeraj, P., &Khusdeep, D. 2014, "Intellectual Property Rights",1st Edition, PHI learning Private Limited, New Delhi,India.
- 3 <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>.
- 4 <https://knowledgentia.com/knowledgeate>

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