Dr. N.G.P.ARTS AND SCIENCE COLLEGE (Autonomous)

REGULATIONS 2021-22 for Under Graduate Programme
(Outcome Based Education model with Choice Based Credit System)

Bachelor of Science in Artificial Intelligence andMachine Learning
(For the students admitted during the academic year 2021-22 and
onwards)

Programme: B.Sc. Artificial Intelligence and Machine Learning

Eligibility

Candidates for admission to the first year of the **Bachelor of Science (Artificial Intelligence and Machine Learning)** 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 thereto by the Academic Council. Subject to such other conditions as may be prescribed there to are permitted to appear and qualify with anyone of the following subjects: Mathematics / Computer Science 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. To achieve professional skills in IT/ ITEs sector

2. Support the growth of economy of a country by starting enterprise with a lifelonglearning attitude.

3. To take part in socio based research activity focused on the advanced areas of AI& ML.

PROGRAMME OUTCOMES:

On the successful completion of the program, the following are the expectedoutcomes.

PO Number	PO Statement
PO1	Apply the Computer Science principles and paradigms in designing system components and processes to meet the specific industry needs.
PO2	To develop intelligent automated systems by applying analytical and programming skills to resolve real time issues and challenges.
PO3	Exhibit proficiency in AI & ML for providing finite solutions to the Industry.
PO4	Build the young minds with research attitude with respect to the needs ofthe society.
PO5	Employ to adapt for the modern platforms in-terms of employability, entrepreneur-ship and also to pursue for their higher studies.

Guidelines for Programmes offering Part I & Part II for Four Semesters:

Part	Subjects	No. of Papers	Credit	Semester No.
I	Tamil / Hindi / French/Malayalam	2	2 x 3 = 6	I to IV
II	English	2	2 x 3 = 6	I to IV
III	Core (Credits 2,3,4)	21	70	I to VI
	Inter Departmental Course (IDC)	4	16	I to IV
	Discipline Specific Elective (DSE)	3	3 x 4 =12	V & VI
	Skill Enhancement Course(SEC)	4	12	III & IV
	Generic Elective(GE)	2	2 x 2=4	III & IV
	Lab on Project (LoP)	1	1	III to V
IV	Environmental Studies(AECC)	1	2	I
	Value Education (VE) (Human Rights, Women's Rights) (AECC)	2	4	II and III
	General Awareness(On-Line Exam) (AECC)	1	2	IV
	RM (AECC)	1	2	V
	Innovation, IPR, Entrepreneurship (AECC)	1	2	VI
V	Extension Activity NSS / Sports / Department Activity	-	1	I to VI
TOTALCREDITS			**140**	

CURRICULUM

B.Sc. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING PROGRAMME

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	CIA	ESE	Total	Credits
First Semester										
Part - I										
211TL1A1TA 201TL1A1HA 201TL1A1MA 201TL1A1FA	Language - I	Tamil-I Hindi-I Malayalam-I French – I	4	1	-	3	25	75	100	3
Part - II										
211EL1A1EA	Language - II	Professional English – I	4	-	1	3	25	75	100	3
Part - III										
214AI1A1CA	Core - I	Programming in C	4	1	-	3	25	75	100	4
212MT1A1IE	IDC - I	Discrete Mathematical Structures	4	1	-	3	25	75	100	4
214AI1A1CP	Core Practical - I	C Programming	-	-	4	3	40	60	100	2
214AI1A1CQ	Core Practical - II	OST: Linux and Shell Programming	-	-	4	3	40	60	100	2
Part - IV										
193MB1A1AA	AECC - I	Environmental Studies	2	-	-	3	-	50	50	2
		Total	**18**	**3**	**9**	**-**	**-**	**-**	**650**	**20**

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
Second Semester										
Part - I										
191TL1A2TA 201TL1A2HA 201TL1A2MA 201TL1A2FA	Language - I	Tamil-II Hindi-II Malayalam-II French – II	4	1	-	3	25	75	100	3
Part – II										
211EL1A2EA	Language - II	Professional English – II	4	-	1	3	25	75	100	3
Part – III										
214AI1A2CA	Core - II	Data Structures and Algorithms	4	1	-	3	25	75	100	4
214AI1A2CB	Core - III	Operating Systems	4	-	-	3	25	75	100	4
214AI1A2CP	Core Practical - III	Data Structures using C	-	-	4	3	40	60	100	2
212MT1A2IE	IDC - II	Probability and Statistics	4	1	-	3	25	75	100	4
Part - IV										
196BM1A2AA	AECC - II	Human Rights	2	-	-	3	-	50	50	2
		Total	**22**	**3**	**5**	**-**	**-**	**-**	**650**	**22**

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
Third Semester										
Part – III										
214AI1A3CA	Core - IV	Relational Database Management System	4	1	-	3	25	75	100	4
214AI1A3CB	Core -V	Foundations of Artificial Intelligence	4	1	-	3	25	75	100	4
214AI1A3CP	Core Practical -IV	SQL - PLSQL	-	-	4	3	40	60	100	2
212PY1A3IB	IDC - III	Digital Computer Fundamentals	4	-	-	3	25	75	100	4
214AI1A3SA	SEC - I	Programming in Java	4	-	-	3	25	75	100	4
214AI1A3SP	SEC Practical - I	Java Programming	-	-	4	3	40	60	100	2
	GE - I		2	-	-	3	-	50	50	2
	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part – IV										
191TL1A3AA		Basic Tamil								
191TL1A3AB	AECC - III	Advanced Tamil	2	-	-	3	-	50	50	2
195CR1A3AA		Women's Rights								
		Total	**20**	**2**	**8**	**-**	**-**	**-**	**700**	**24**

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
Fourth Semester										
Part – III										
214AI1A4CA	Core - VI	Machine Learning Techniques	4	1	-	3	25	75	100	4
214AI1A4CB	Core - VII	Python Programming	4	1	-	3	25	75	100	4
214AI1A4CP	Core Practical - V	Artificial Intelligence & Machine Learning	-	-	4	3	40	60	100	2
213BT1A4IB	IDC - IV	Bioinformatics & Technologies	4	-	-	3	25	75	100	4
214AI1A4SA	SEC - II	Data Mining	4	-	-	3	25	75	100	4
214AI1A4SP	SEC Practical - II	Data Mining using R	-	-	4	3	40	60	100	2
	GE - II		2	-	-	3	-	50	50	2
214AI1A5LP	LoP	Lab on Project	-	-	-	-	-	-	-	-
Part – IV										
191TL1A4AA	AECC - IV	Basic Tamil	2	-	-	3	-	50	50	2
191TL1A4AB		Advanced Tamil								
192PY1A4AA		General Awareness								
Total			20	2	8	-	-	-	700	24

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
Fifth Semester										
Part – III										
214AI1A5CA	Core - VIII	Natural Language Processing	4	1	-	3	25	75	100	4
214AI1A5CB	Core - IX	Computer Networks	4	-	-	3	25	75	100	3
214AI1A5CC	Core - X	Internet of Things & its Applications	4	-	-	3	25	75	100	4
214AI1A5CD	Core - XI	Cyber Security	3	-	-	3	25	75	100	3
214AI1A5CP	Core Practical - VI	NLP using Python	-	-	4	3	40	60	100	2
214AI1A5CQ	Core Practical - VII	Computer Networks	-	-	4	3	40	60	100	2
214AI1A5DA		Text and Web Mining								
214AI1A5DB	DSE – I	Software Engineering	4	-	-	3	25	75	100	4
214AI1A5DC		Cognitive Analytics								
214AI1A5LP	LoP	Lab on Project	-	-	-	-	50	-	50	1
214AI1A5TA	IT	Industrial Training	**Grade A to C**							
Part – IV										
192MT1A5AA	AECC -V	Research Methodology	2	-	-	3	-	50	50	2
		Total	**21**	**1**	**8**	-	-	-	**800**	**25**

Course Code	Course Category	Course Name	L	T	P	Exam (hours)	Max Marks			Credits
							CIA	ESE	Total	
Sixth Semester										
Part – III										
214AI1A6CA	Core - XII	Neural Network and Deep Learning	4	-	-	3	25	75	100	4
214AI1A6CB	Core - XIII	Cloud Computing	4	-	-	3	25	75	100	4
214AI1A6CP	Core Practical -VIII	Neural Networks and Deep Learning in Python	-	-	4	3	40	60	100	2
214AI1A6DA	DSE – II	Augmented Reality and Virtual Reality	4	-	-	3	25	75	100	4
214AI1A6DB		Human Computer Interaction								
214AI1A6DC		Mobile and Pervasive Computing								
214AI1A6DD	DSE – III	Pattern and Anomaly Detection	4	-	-	3	25	75	100	4
214AI1A6DE		Computational Intelligence								
214AI1A6DF		Wireless Networks								
Part - IV										
193BC1A6AA	AECC - VI	Innovation, IPR and Entrepreneurship	2	-	-	3	-	50	50	2
214AI1A6CV	Core – IX - Project	Project Work	-	-	8	-	40	60	100	4
Part - V										
214AI1A6XA		Extension Activity	-	-	-	-	50	-	50	1
		Total	**18**	**-**	**12**	**-**	**-**	**-**	**700**	**25**
								Grand Total	**4400**	**140**

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.	214AI1A5DA	Text and Web Mining
2.	214AI1A5DB	Software Engineering
3.	214AI1A5DC	Cognitive Analytics

Semester VI (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	214AI1A6DA	Augmented and Virtual Reality
2.	214AI1A6DB	Human Computer Interaction
3.	214AI1A6DC	Mobile and Pervasive Computing

Semester VI (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	214AI1A6DD	Pattern and Anomaly Detection
2.	214AI1A6DE	Computational Intelligence
3.	214AI1A6DF	Wireless Networks

GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective Course

Semester III (GE-I)

S. No.	Course Code	Course Name
1	214AI1A3GA	Applied Artificial Intelligence

Semester IV (GE-II)

S. No.	Course Code	Course Name
1	214AI1A4GA	Open Source Technology

EXTRA CREDIT COURSES

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

S. No.	Course Code	Course Name
1	214AI1ASSA	Data Visualization Techniques
2	214AI1ASSB	Internet Programming

CERTIFICATE PROGRAMMES

The following are the programme offered to earn extra credits:

S. No.	Course Code	Course Name
1	4AI5A	Intelligent Systems

Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Artificial Intelligence and Machine Learning (Students admitted during the AY 2021-22)

MOOC (NPTEL/SWAYAM/ SPOKEN TUTORIAL)

The following are the online courses offered:

Please refer the following link to select the courses

www.swayam.org

www.nptel.ac.in

www.spoken-tutorial.org

REGULATION 2019-20

Effective from the academic year 2019-20 and applicable to the students admitted to the Degree of Bachelor of Science / Commerce/Arts.

1. NOMENCLATURE

1.1 Faculty: Refers to a group of programmes concerned with a major division of knowledge are. Eg. Faculty of Computer Science consists of disciplines like Departments of Computer Science, Information Technology, Computer Technology and Computer Applications.

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 2015–2018 refers to students belonging to a 3 year Degree programme admitted in 2015 and completing in 2018.

1.4 Course Refers to a component (a paper) 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 and learning needs and the credits may be assigned suitably.

a) **Core Courses**
   A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

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**: DSE courses are the courses offered by the respective disciplinary/ interdisciplinary programme.

d) **Skill Enhancement Courses (SEC):** SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

e) **Ability Enhancement Courses (AEC):** AECC courses are the courses based upon the content that leads to Knowledge enhancement. These are mandatory for all disciplines. Environmental Science, Human Rights, Women's Rights, General Awareness, IPR and Innovation, Entrepreneurship Development and Research Methodology.

All these courses should be taught according to Outcome based Education.

1.5 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.

1.6 Project work

Itis considered as a special 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.

Extra credits

Extra credits will be awarded to a student for achievements in co-curricular activities carried out outside the regular class hours. The guidelines for the award of extra credits are given in section- these credits are not mandatory for completing the programme.

Advanced Learner Course (ALC):

ALC is doing work of a higher standard than usual for students at that stage in their education. Research work carried out in University/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days will be considered as Advanced Learners Course.

2. STRUCTURE OF PROGRAMME

2.1 PART – I: LANGUAGE

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

2.2 PART – II : ENGLISH

English will be offered during the first two / four semester.

2.3 PART – III :

- Core course

- Inter Departmental Course (IDC)

- Discipline Specific Elective (DSE)

- Skill Enhancement Course (SEC)

- Generic Elective (GE)

- Lab on Project (LoP)

- Industrial Training (IT)

2.4 PART IV

2.4.1 Ability Enhancement Compulsory Course

The ability enhancement courses such as i)Environmental Studies, ii) Human Rights, iii) Womens' Rights, iv) General Awareness, v) Research Methodology, vi) Intellectual Property Rights(IPR), Innovation and Entrepreneurship or IPR and Innovation from I to VI Semester.

a) Those who have not studied Tamil up to XII Std and taken a non-Tamil language under Part-I shall take Tamil comprising of two courses.

(OR)

b) Those who have studied Tamil up to XII std and taken a non-Tamil language under Part-I shall take Advanced Tamil comprising of two courses in the third and fourth semesters.

(OR)

c) Students who come under the above a+b categories are exempted from Women's Rights and General awareness during III and IV semester respectively.

2.5 PART V: EXTENSION ACTIVITIES

The following co-curricular and extracurricular activities are offered under institutional / department Association/ club/ extension programmes for the students under extension activities from I to IV semester.

a) Institutional

- National Service Scheme (NSS)

  Participation in any one of the camps organized by NSS unit.

- Friends of Police(FoP)

  Active participation in traffic regulation and other extension activities

- Sports

  Active participation in any one of the sports activities

- Youth Red Cross (YRC)

  Active participation in YRC programmes

b) Department Association

Membership and active participation in the department association activities.

c) Clubs

Membership and active participation in any one club activities.
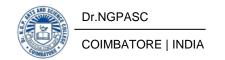
1. CREDIT ALLOTTMENT
The following is the credit allotment:

- **Lecture Hours (Theory)**   : Max.1 credit per lecture hour per week,

  1 credit per tutorial 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

2. DURATION OF THE PROGRAMME

- A student is normally expected to complete the B.Sc. /B.com. /BA Programme in 6 semesters. However, in any case not more than 7 consecutive semesters. Failing which the concern BoS will identify suitable / equivalent course.

3. REQUIREMENTS FOR COMPLETION OF A SEMESTER

Candidate shall be permitted to appear for the End Semester examinations for any semester(practical/theory) if

i) He/she secures **not less than 75%** of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the Head of the institution, of having satisfactorily completed the course of study prescribed in the scheme of examinations for that semester as required by these regulations, and

iii) His/her conduct / character is satisfactory.

- Provided that it shall be open to the Academic council, or any authority delegated with such powers by the Academic council, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions. (Refer the **Ordinance No.1 of 1990 of the Bharathiar University)**
- A candidate who earned 75% of attendance and more in the current semester are eligible to write the examination in current semester subjects.
- A candidate who has secured **less than 65% but 55%** and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the later semester.
- A candidate who has secured **less than 55%** of attendance in any semester shall not be permitted to appear for the regular examinations and to continue the study

in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

- A candidate who has secured **less than 65%** of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned Head of the department after rejoining the same course.

4. 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 (including the project work and Viva-Voce examination in the final Semester) shall be 100 with the following breakup.

(i) Theory Courses

Continuous Internal Assessment (CIA)	:	**25** Marks
End Semester Exams (ESE)	:	**75** Marks

(ii) For Practical/ Courses

Continuous Internal Assessment (CIA)	:	**40** Marks
End Semester Exams (ESE)	:	**60** Marks

a. The following are the distribution of marks for the **Continuous Internal Assessment** in **Practical, Project / Industrial Training Courses**.

Continuous Internal Assessment for Practical Courses:

S.No	For - UG practical courses	Distribution of Marks					
1	Minimum 10 experiments to be conducted/practical paper/semester	20	15	10	8	5	4
2	Tests : Two tests out of which one shall be during the mid semester and the other to be conducted as model test at the end of the semester.)	16	10	10	8	6	6
3	Observation Note Book	4	5	5	4	4	-
	TOTAL MARKS	**40**	**30**	**25**	**20**	**15**	**10**

Project viva-voce / Industrial Training

The following are the distribution of marks for the continuous Internal assessment in UG Project/Industrial Training courses.

S.no	For - UG Project courses//Industrial Training	Distribution of Marks	
1	Review-I	5	10
2	Review-II	5	10
3	Review-III	5	10
4	Document, Preparation and Implementation	10	10
	TOTAL MARKS	**25**	**40**

b. Following are the distribution of marks for the **External Examination** in UG Project /Industrial Training courses

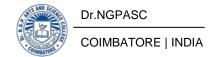| S.no	For - UG Project //Industrial Training courses	Distribution of Marks	
1	Record Work and Presentation	35	40
2	Viva-Voce	15	20
	TOTAL MARKS	**50**	**60**

Part – IV

The courses offered under Part – IV shall have only End Semester Examinations (ESE) for a maximum of 50 Marks. However, Students who select "Tamil" under Part IV, will be assessed only by Continuous Internal Assessment (CIA). The marks shall be furnished to the COE by the concerned Course teacher through the Head of the Department.

6.1CONTINUOUS ASSESSMENT EXAMS

6.1 Theory courses

a)Continuous Internal Assessment test (CIA)

There will be a Minimum of two Continuous Assessment Exams, for each Theory course. The first and Second Assessment Exams will be conducted for a Maximum of 50 Marks and 75 marks respectively. The total marks secured in the Two Assessment Exams will be converted to 15 Marks.

b) Utilization of Library

Marks will be awarded to the student based on the hours spent in the library after the working hours and submission of report by the student.

Hours spent in Library	Marks	Type of Document submitted
2	1	Report/ Assignment/ Class presentation
4	2	
6	3	
8	4	
10	5	
12	6	

- During the Library hour, the student must spend time in reading the articles, books, journals of their subject of interest
- Each student should borrow minimum three books during the semester
- **Student is expected to submit one Report / Assignment/ Class Presentation per Course.**

c) Class Participation

Active participation in classroom discussion by the student will be evaluated based on Integration of knowledge, Interaction and Participation and demonstration of knowledge.

d)PAPERS / REPORTS/ ASSIGNMENTS/ CLASS PRESENTATION

The student will be evaluated based on his ability to do analysis of application of theory to real world problems or creative extension of class room learning and his/her ability to communicate the given topic effectively and clearly.

Continuous Assessment OBE Rubrics Score Sheet

Degree: _____   Branch: _____   Semester: _____

Course Code: _____   Course: _____

Max. Marks: Internal:_____   External: _____   Total: _____

S.No.	REG.NO	THEORY / PRACTICAL & LIBRARY CLASS PARTICIPATION (15) (Compulsory)				RUBRICS ASSESSMENT (SELECT ANY ONE)									Total Marks out of : 30	Total Marks out of : 16 / 10 / 08 / 04
						PAPERS / REPORTS (15)			ASSIGNMENTS (15)			CLASS PRESENTATION (15)				
		Library	Integration of Knowledge	Interaction & Participation	Demonstration of Knowledge	Organization & Knowledge	Format & Spelling	Reference / Experiments	Demonstration of Knowledge	Format & Spelling	Reference	Content & Coherence	Creativity and Speaking Skills	Duration of Presentation		
		6	3	3	3	5	5	5	5	5	5	5	5	5		
1																

The following are the distribution of marks for the continuous internal assessment in UG practical courses

S.No	For - UG Practical Courses	Distribution of Marks					
1	Minimum 10 experiments to be conducted/practical paper/semester	20	15	10	8	5	4
2	Tests : Two tests out of which one shall be during the mid semester and the other to be conducted as model test at the end of the semester.)	16	10	10	8	6	6
3	Observation Note Book	4	5	5	4	4	-
	TOTAL MARKS	**40**	**30**	**25**	**20**	**15**	**10**

Dr.NGPASC
_____
COIMBATORE | INDIA   *B.Sc. Artificial Intelligence and Machine Learning (Students admitted during the AY 2021-22)*

7.FOR PROGRAMME COMPLETION

Programme Completion (for students admitted in the A.Y.2019-20 and Onwards)

Student has to complete the following:

i) **Part I,II,III,IV,V as mentioned in the scheme**

ii) **Industrial/ Institutional training**

Students must undertake industrial / institutional training for a minimum of 15 days and not exceeding 30 days during the IV semester summer vacation. The students will submit the report for evaluation during V semester.

Based on the performance Grade will be awarded as follows:

Marks Scored	Grade to be awarded
75 and above	A
60-74	B
40-59	C
< 40	Re-Appearance

iii) **Skill Enhancement Training**

Student must undergo Skill Enhancement training on Communication skills (I and II Semester) and Quantitative aptitude (III and IV Semester) respectively each for 40h.

8. EXTRA CREDITS

- Earning extra credit is mandatory. However, it is not essential for programme completion

- Extra Credits will be awarded to a student for achievement in co-curricular/ extracurricular activities carried other than the regular class-hours.

- The detailed guidelines for the award of extra credits are as follows:

- A student is permitted to earn a maximum of **five** extra Credits during the programme duration of UG from I to V Semester.

- Candidate can claim a maximum of 1 credit under each category listed.

The following are the guidelines for the award of Extra credits:

8.1 Proficiency in foreign language

Qualification	Credit
A pass in any foreign language in the examination conducted by an authorized agency	1

8.2 Proficiency in Hindi

Qualification	Credit
A pass in the Hindi examination conducted by Dakshin Bharat Hindi PracharSabha	1

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

8.3 Self study Course

Qualification	Credit
A pass in the self study courses offered by the department	1

- The candidate shouldregister the self study course offered by the department only in the III semester

8.4 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.

Qualification	Credit
A pass in the type writing / short hand examination offered by TNDTE	1

8.5   Diploma/Certificate

Courses offered by any recognized University / NCVRT

Qualification	Credit
A pass in any Certificate course/ Diploma / PG Diploma	1

8.6 CA/ICSI/CMA

Qualification	Credit
Qualifying foundation / Inter level / Final in CA/ICSI/CMA / etc.,	1

8.7 Sports and Games

The Student can earn extra credit based on their Achievement in sports as given below:

Qualification	Credits
Achievement in University/ State / National/ International	1

8.8 Online Courses

Pass in any one of the online courses

Qualification	Credit
SWAYAM/NPTEL/Spoken Tutorial etc.,	1

8.9 Publications /Conference Presentations (Oral/Poster)/Awards

Qualification	Credit
Research Publications in Journals/ oral/poster presentation in Conference	1

8.10 Innovation / Incubation / Patent / Sponsored Projects / Consultancy

Qualification	Credit
Development of model/ Products /Prototype /Process/App/Registration of Patents/ Copyrights/Trademarks/Sponsored Projects /Consultancy	1

8.11 Representation

Qualification	Credit
State / National level celebrations such as Independence day, Republic day Parade,National Integration camp etc.,	1

Course Code	Course Name	Category	L	T	P	Credit
211TLIA1TA	தமிழ்த் தாள் - I	மொழி- I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

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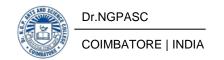
COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	வாழ்க்கைத்திறன்கள் (Life Skills) – மாணவனின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1,K2,K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2,K4
CO3	பாட இணைச் செயல்பாடுகள் (Co-curricular activities)	K2,K3,K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K5, K6

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

211TLIA1TA	தமிழ்த்தாள் - I	SEMESTER I

Total Credits: 03

Total Instruction Hours: 60 h

Syllabus

Unit I   மறுமலர்ச்சிக் கவிதைகள்   12 h

1. உயிர் பெற்ற தமிழர் பாட்டு   - பாரதியார்
2. படி   - பாரதிதாசன்
3. போராடப் புறப்பட்டோம்   - தமிழ் ஒளி
4. தமிழ்க் கொலை புரியாதீர்   - புலவர் குழந்தை
5. திரைத்தமிழ்

    அ) சும்மா கிடந்த நிலத்தை எனத்தொடங்கும் பாடல்   -

        பட்டுக்கோட்டை கல்யாண சுந்தரனார்

    ஆ) சமரசம் உலாவும் இடமும் எனத்தொடங்கும் பாடல்   - மருதகாசி

    இ) உன்னை அறிந்தால் எனத்தொடங்கும் பாடல்   - கண்ணதாசன்

Unit II   புதுக்கவிதைகள்   12 h

1. கடமையைச் செய்   - மீரா
2. அம்மாவின் பொய்கள்   - ஞானக்கூத்தன்
3. செருப்புடன் ஒரு பேட்டி   - மு.மேத்தா
4. ஒரு சிங்கவால் குரங்கின் மரணம்   - சிற்பி
5. கடல்கோள் 2004   - முத்தமிழ் விரும்பி
6. கரிக்கிறது தாய்ப்பால்   - ஆரூர் தமிழ்நாடன்
7. ஐந்தாம் வகுப்பு 'அ' பிரிவு   - நா. முத்துக்குமார்
8. ஹைகூ கவிதைகள்   - 15 கவிதைகள்

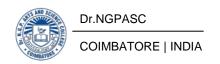**Unit III**   பெண்ணியம்   08 h

1. ஒரு கதவும் கொஞ்சம் கள்ளிப்பாலும்   - தாமரை
2. நீரில் அலையும் முகம்   - அ. வெண்ணிலா
3. தொட்டிச் செடி   - இளம்பிறை
4. ஏனிந்த வித்தியாசங்கள்   - மல்லிகா

Unit IV *சிறுகதைகள்* 15 h

1. வேப்பமரம் - ந. பிச்சமூர்த்தி
2. அகல்யை - புதுமைப்பித்தன்
3. ஒருபிடி சோறு - ஜெயகாந்தன்
4. காய்ச்சமரம் - கி. ராஜநாராயணன்
5. நிராசை - பாமா
6. குதிரை மசால் தாத்தா - சு. வேணுகோபால்

Unit V இலக்கியவரலாறு, இலக்கணம் மற்றும் பயிற்சிப் பகுதி 13 h

அ. இலக்கிய வரலாறு

1. மறுமலர்ச்சிக் கவிஞர்களின் தமிழ்ப்பணிகள்
2. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்
3. சிறுகதையின் தோற்றமும் வளர்ச்சியும்

ஆ. இலக்கணம்

1. வல்லினம் மிகும், மிகா இடங்கள் (ஒற்றுப்பிழை நீக்கி எழுதுதல்)
2. ர,ற ,ல, ழ, ள ,ண, ந,ன, வேறுபாடு (ஒலிப்பு நெறி, சொற்பொருள் வேறுபாடு அறிதல்)
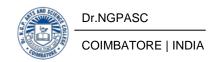
இ. படைப்பாக்கப் பயிற்சி

1. கவிதை, சிறுகதை எழுதுதல்

Text Books

1 செய்யுள் மற்றும் உரைநடைத் திரட்டு . 2021. தொகுப்பு : தமிழ்த் துறை , டாக்டர் என். ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி. நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை.

References

1 பேராசிரியர் முனைவர் பாக்கியமேரி. இலக்கணம் இலக்கிய வரலாறு மொழித்திறன். முதல் பதிப்பு 2013 . பூவேந்தன் பதிப்பகம். சென்னை

2 தமிழண்ணல் . புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு . பதினாறாம் பதிப்பு 2000 மீனாட்சி புத்தக நிலையம். மதுரை.

3 பேராசிரியர் புலவர் இளவரசு ,சோம. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு. எட்டாம் பதிப்பு ஜூலை 2012.மணிவாசகர் பதிப்பகம்.சென்னை

4 தமிழ் இணையக் கல்விக்கழகம். <http://www.tamilvu.org/ >

Course Code	Course Name	Category	L	T	P	Credit
201TL1A1FA	FRENCH- I	Language - I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- 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.
- Competency in translating simple French sentences into English and vice versa.
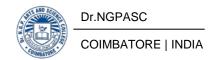
COURSE OUTCOMES

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	learn the adjectives and the classroom environment in France.	K2
CO3	Learn the Plural, Articles and the Hobbies.	K3
CO4	learn the Cultural Activity in France.	K3
CO5	learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S   Strong   M   Medium   L   Low

201TL1A1FA	FRENCH- I	SEMESTER I

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
• Saluer • Enter en contact • avec quelqu'un. • Se presenter. • S'excuser	En cours de cuisine, premiers contacts avec les members d'un groupe	• Comprendre des personnes qui se saluent. • Ēchanger pour entrer en contact, se présenter, saluer, s'excuser. • Communiquer avec *tu* ou *vous.* • Comprendre les consignes de classe • Ēpeler son nom et son prénom. Computer jusqu'à 10.

Unit II   Enchanté I Page 20   12 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
• Demander de se presenter. • Présenter quelqu'un.	Dans la classe de français, se presenter et remplir une fiche pour le professeur.	• Comprendre les informations essentielles dans un échange en milieu professionnel. • Ēchanger pour se presenter et présenter quelqu'un.

Unit III   J'adore I Page 30   12 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
• Exprimer ses gouts.	Dans un café, participer à une soirée de rencontres	• Dans une soirée de recontres rapid comprendre des personnes qui échangent sur elles et sur leurs goût • Comprendre une personne

B.Sc. Artificial Intelligence and Machine Learning (Students admitted during the AY 2021-22)

rapides et remplir de taches d'appréciation.	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
• Présenter quelqu'un	Dans un café, participer à une soirée de rencontres rapides et remplir de taches d'appréciation	• 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		

Unit V   Tu veux bien? Page 46   10 h

Objectifs de Communication	Tâche	Activités de réception et de production orale
• Demander à quelqu'un de faire quelque chose. • Demander poliment. • Parler d'actions passes.	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.

Text Books

1   Regine Merieux, Yves Loiseau, LATITUDES 1(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.

Course Code	Course Name	Category	L	T	P	Credit
201TL1A1MA	MALAYALAM	Language - I	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- develop the writing ability and develop reading skill.

- various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S   Strong   M   Medium   L   Low

201TL1A1MA	MALAYALAM - I	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

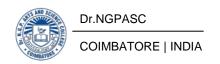**Unit I**   Novel   12 h

    1. Alahayude penmakkal

Unit II   Novel   12 h

    1. Alahayude penmakkal

Unit III   Short Story   14 h

    2. Nalinakanthi

Unit IV   Short Story   10 h

    2. Nalinakanthi

Unit V   12 h

    Composition & Translation

Text Books

1 Alahayude penmakkal (NOVEL) By Sara Joseph Published   by   Current books Thrissur.

2 Nalinakanthi (Short story) By T.Padmanabhan Published by DC.Books Kottayam

3 Expansion of ideas,General Essay And Translation.

References

1   Malayala Novel Sahithyam

2   Malayala cherukatha Innale Innu.

Course Code	Course Name	Category	L	T	P	Credit
201TL1A1HA	HINDI-I	Language 1	4	1	-	03

PREAMBLE

This course has been designed for students to learn and understand

- the writing ability and develop reading skill.

- various concepts and techniques for criticizing literature, to learn the techniques for expansion of ideas and translation process.

   communicate Hindi

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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S   Strong   M   Medium   L   Low

Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Artificial Intelligence and Machine Learning (Students admitted during the AY 2021-22)

201TL1A1HA	HINDI-I	SEMESTER I

Total Credits: 03

Total Instruction Hours: 60 h

Syllabus

Unit I   गद्य – नूतन गद्य संग्रह (जय प्रकाश)   12 h

   पाठ 1- रजिया

   पाठ 2- मक्रील

   पाठ 3- बहता पानी निर्मला

   पाठ 4- राष्ट्रपिता महात्मा गाँधी

Unit II   कहानी कुंज- डाँ वी.पी. 'अमिताभ'   12 h

   कहानी कुंज- डाँ वी.पी. 'अमिताभ' (पाठ 1-4)

Unit III   व्याकरण   12 h

   शब्द विचार (संज्ञा, सर्वनाम, कारक, विशेषण)

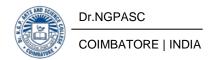**Unit IV**   अनुच्छेद लेखन   12 h

   अनुच्छेद लेखन

Unit V   अनुवाद   12 h

   अभ्यास-III (केवल अंग्रेजी से हिन्दी में)

Text Books

1   प्रकाशक: सुमित्र प्रकाशन 204 लीला अपार्ट्मेंट्स, 15 हेस्टिंग्स रोड'   अशोक   नगर इलाहाबाद-211001 (Unit - I)

2   प्रकाशक: गोविन्द प्रकाशन सदर बाजार, मथुरा उत्तर प्रदेश – 281001 (Unit-II)

3   पुस्तक: व्याकरण प्रदिप – रामदेव प्रकाशक: हिन्दी भवन 36 टेगोर नगर इलाहाबाद – 211024 (Unit-III)

4   पुस्तक: व्याकरण प्रदिप – रामदेव प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024 (Unit-IV)

5   (पाठ 1 to 10) प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17 (Unit – V)

Course Code	Course Name	Category	L	T	P	Credit
211EL1A1EA	**PROFESSIONAL ENGLISH - I**	Language - II	4	0	1	3

PREAMBLE

This course has been designed for students to learn and understand

- To experience the effect of dialogue, the brilliance of imagery and the magnificence of varied genre
- To strengthen the student's English vocabulary and understanding of English sentence structure
- To communicate effectively and acquire knowledge on 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	Extend interest in and appreciation of the works of eminent writers from various literatures	K2
CO2	Interpret the genres in literature through the master works of great visionaries	K3
CO3	Perceive the language gaps through a clear model of the grammatical structure	K5
CO4	Analyze the concepts of texts in the course of different lessons which are realistic and discursive in nature	K4
CO5	Value the integral concepts of English grammar necessarily required in their linguistic competence	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Artificial Intelligence and Machine Learning (Students admitted during the AY 2021-22)

211EL1A1EA	PROFESSIONAL ENGLISH - I	SEMESTER I

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I   Genre Studies - I   10 h

The Road Not Taken – Robert Frost

All the World's a Stage – William Shakespeare

Whitewashing the Fence – Mark Twain

The Face of Judas Iscariot - Bonnie Chamberlain

Soul Gone Home – Langston Hughes

Unit II   Genre Studies - II   11 h

Ode on a Grecian Urn – John Keats

Mending Wall – Robert Frost

My Early Days – Dr. A.P.J. Abdul Kalam

Nightfall – Isaac Asimov

A Kind of Justice – Margret Atwood

Unit III   Grammar - I   14 h

Parts of Speech

Articles and Prepositions

Subject Verb Agreement

Degrees of Comparison
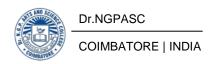
Sequence of Tenses

Unit IV   Genre Studies - III   11 h

On his Blindness - John Milton

Small - Scale Reflections on a Great House – A.K. Ramanujan

On Prayer – Khalil Gibran

The Garden Party – Katherine Mansfield

The Tell - Tale Heart – Edgar Allen Poe

Unit V   Grammar - II   14 h

If Conditionals

Modal Auxiliary Verbs

Question Types/Tags

Voice

Direct and Indirect Speech

Text Books

1   Prabha, Vithya. R and S. Nithya Devi. 2019. Sparkle: English Textbook for First Year. McGraw Hill Education, Chennai.

2   Wren and Martin. 2006. High School English Grammar and Composition. S. Chand Publishing, New Delhi.

References

1   Bajwa and Kaushik. 2010. Springboard to Success- Workbook for Developing English and Employability Skills. Orient Black Swan, Chennai

2   Syamala. V. 2002. Effective English Communication for You. Emerald Publishers, Chennai.

3   Krishnaswamy. N, Lalitha Krishnaswamy & B.S. Valke. 2015. Eco English, Learning English through Environment Issues. An Integrated, Interactive Anthology. Bloomsbury Publications, New Delhi.

4   Krishnaswamy. N. 2000. Modern English: A Book of Grammar, Usage And Composition. Macmillan, New Delhi.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A1CA	**PROGRAMMING IN C**	**CORE**	**4**	**1**	**0**	**4**

PREAMBLE

This course has been designed for students to learn and understand

- ☐ The fundamental aspects of C programming.
- ☐ To develop logic will help them to create programs.
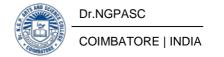- ☐ Representation & working of arrays, pointers, functions and file concepts.

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 C Language.	K2
CO2	Apply the control statements in programs.	K2
CO3	Understand the representation and usage of arrays.	K2
CO4	Develop programs using functions and storage classes.	K3
CO5	Execute programs with pointers and files.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	S	S	M	L	M
CO4	M	S	M	M	M
CO5	M	S	M	M	M

S   Strong   M   Medium   L   Low

214AI1A1CA	PROGRAMMING IN C	SEMESTER I

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I   C Language Fundamentals   12 h

C fundamentals - Character set - Identifier and keywords - data types - constants - Variables - Declarations - Expressions - Statements - Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators - Library functions - Structure of C program.

Unit II   Conditional and Looping Statements   12 h

Data input/output functions -formatted I/O - unformatted I/O- Simple C programs. Flow of control: if statement- if-else - nested if-else. Loops: while loop- do-while- for loop- Nested control structures - switch - break and continue, go to statements - Comma operator.

Unit III   Arrays and Strings   12 h

Arrays - Defining and processing - passing arrays to functions - types of arrays- one-dimensional arrays- multi-dimension arrays - Strings - Structures - User defined data types - Passing structures to functions - Self-referential structures - Unions - Bit wise operations.

Unit IV   Functions and Storage Classes   12 h

Functions -Definition - types of functions - advantages of functions - prototypes -passing arguments - call by value - call by reference- Recursions. Storage Classes - Automatic - External - Static- Register Variables - Multi-file programs.

Unit V   Pointers and Files   12 h

Pointers - Declarations - Advantages of pointers - Passing pointers to Functions - Operation in Pointers - Pointer and Arrays - Arrays of Pointers - Structures and Pointers - Pointer arithmetic. Files: Creating Processing, Opening and Closing a data file.

Text Book

1   E.Balagurusamy, (2017), "Programming in ANSI C", (7th Edn.), TMH.

References

1   ReemaThareja , (2015), "Programming in C", (2nd Edn), Oxford University Press

2   Ashok N. Kamthane, (2009), "Programming and Data Structures", (1st Edn), Pearson Education.

3   H. Schildt, (2000), "C: The Complete Reference", (4th Edn), TMH.

Course Code	Course Name	Category	L	T	P	Credit
212MT1A1IE	**DISCRETE MATHEMATICAL STRUCTURES**	IDC	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- the logic and Proof
- basic concept of counting and graph
- apply the concept of counting Techniques

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Discuss the Logic and Proof	K2
CO2	Describe the concepts Induction and Recursion	K2
CO3	Understand the concept of Counting	K3
CO4	compute the concept of graph	K3
CO5	Apply the concept Advanced counting Techniques	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

212MT1A1IE	DISCRETE MATHEMATICAL STRUCTURES	SEMESTER I

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I   Logic and Proof   12 h

Propositional Logic - Propositional Equivalences - Predicates and quantifiers - Nested quantifiers - Sets - Set operations - Functions

Unit II   Induction and Recursion   12 h

Mathematical Induction - Strong induction and well - ordering - Recursive definitions and structural Induction - Recursive Algorithms

Unit III   Counting   12 h

The basics of counting - The Pigeonhole principle - Permutation and Combination - Binomial coefficient - Generalized Permutation and Combination - Generating Permutation and Combinations

Unit IV   Graph   12 h
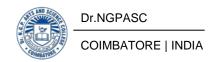
Graphs and Graph models - Graph terminology and special types of graph - representation of graph and graph isomorphism - Connectivity - Euler and Hamilton Paths - Shortest path problems

Unit V   Advanced counting Techniques   12 h

Recurrence relations - Solving linear recurrence relations - Divide and conquer algorithms and recurrence relations - Generating functions - Inclusion and exclusion - Application of Inclusion and exclusion

Note: Theory 20% and problem 80%

Text Book

1   Kenneth Rosen.(2011). Discrete Mathematics and Its Applications (7th ed.), McGraw Hill Company, New Delhi

References

1   Tremblay ,J .P., and Manohar R., (2001). Discrete Mathematical Structures with Applicationsto Computer Science(1st ed.), McGraw-Hill Book Company, New Delhi

2   Sharma,J.K. (2011).Discrete Mathematics (Third Edition),RajivBeri for Macmillan Publishers India Ltd.New Delhi.

3   Dr.A.Singaravelu., and Dr. M.P Jeyaraman (2016).Discrete Mathematics , Meenakshi Agency Chennai

4   Hein,J.L., (2010). Discrete Structures, Logic, and Computability (3rd ed.), Jones and Bartlett Publishers, New Delhi.

214AI1A1CP	CORE PRACTICAL: C PROGRAMMING	SEMESTER - I

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Implement programs using I/O Statements.
2	Create programs with C Operators.
3	Develop C program using Conditional statements.
4	Build C programs using Looping statements.
5	Implement the Arrays in C.
6	Write a C program using Functions.
7	Implement the String handling functions in C.
8	Experiments Pointers and storage classes in C.
9	Implement C program using Structures.
10	Programs using Unions.
11	Create files using File handling operations in C.
12	Write C program using Command line arguments.

Note: Out of 12 - 10 Mandatory

214AI1A1CQ	CORE PRACTICAL: OST: LINUX ANDSHELL PROGRAMMING	SEMESTER- I

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Develop a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line number.
2	Create a shell script that deletes all lines containing a specified word.
3	Design a shell script to list all of the directory files in a directory.
4	Write a shell script to find the factorial of given integer.
5	Simple shell script for basic arithmetic and logical calculations.
6	Create a shell scripts to explore system variables such as PATH, HOME
7	Write a shell script to display list of users currently logged in.
8	Execute the various system administrative commands.
9	Write a shell script to count the number of lines in a file that do not contain vowels.
10	Implement Cat and Move commands using system calls.
11	Write a shell script to delete all the temporary files.
12	Create a shell script to list the files in a directory.

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
193MB1A1AA	VALUE EDUCATION-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
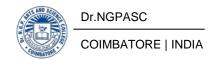- Causes of Pollution and its control

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	inculcate the knowledge on structure, function and energy flow in the Eco system.	K3
CO3	impart knowledge on Biodiversity and its conservation.	K3
CO4	create awareness on effects, causes and control of air, water, soil and noise pollution etc.	K2,K3
CO5	build awareness about sustainable development and Environmental protection	K2,K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

193MB1A1AA	VALUE EDUCATION- ENVIRONMENTAL STUDIES	SEMESTER I

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I   Introduction to Environmental studies& Ecosystems   4 h

Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance; Concept of sustainability and sustainable development. What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

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

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). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.
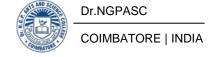
Unit III   Biodiversity and Conservation   5 h

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. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit IV   Environmental Pollution, Environmental Policies & Practices   5 h

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.
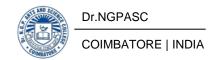
Dr.NGPASC

COIMBATORE | INDIA

B.Sc. Artificial Intelligence and Machine Learning (Students admitted during the AY 2021-22)

Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC). Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context.

Unit V Human Communities and the Environment& Field Work 5 h

Human population and growth: Impacts on environment, human health and welfares.Carbon foot-print. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquakes, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Visit to an area to document environmental assets; river/forest/flora/fauna, etc. Visit to a local polluted site – Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, Delhi Ridge, etc.

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.

3 Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.

4 Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.

5 Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.

6 Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.

7 McCully, P.1996. Rivers no more: the environmental effects of dams(pp. 2964). Zed Books.

8 McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

9 Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.

References

1	Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
2	Rao, M.N. &Datta, A.K. 1987. Waste Water Treatement. Oxford and IBH Publishing Co. Pvt. Ltd.
3	Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
4	Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.

Course Code	Course Name	Category	L	T	P	Credit
191TLIA2TA	பகுதி-1: தமிழ் - தாள்- II	மொழி	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- மொழிப் பாடங்களின் வாயிலாகத் தமிழரின் பண்பாடு, பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்

- கலை மற்றும் மரபுகளை அறியச் செய்தல்

- மாணவர்களின் படைப்பாக்கத் திறன்களை 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) – மாணவனின் செயலாக்கத்திறனை ஊக்குவித்தல்	K1,K2,K3
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K2,K4
CO3	பாட இணைச் செயல்பாடுகள் (Co-curricular activities)	K2,K3,K4
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

191TLIA2TA	பகுதி-1: தமிழ் - தாள்- II	SEMESTER II

Total Credits: 3
Total Instruction Hours: 60 h

Syllabus

Unit I   அற இலக்கியம்   12 h

1. திருக்குறள்

    அ.அறன் வலியுறுத்தல் (அ. எண்: 04)

    ஆ.நட்பாராய்தல்   (அ. எண்: 80)

    இ.சான்றாண்மை   (அ. எண்: 99)

    ஈ.குறிப்பறிதல்   (அ. எண்: 110)

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

Unit II   அற இலக்கியம்   10 h

1. நாலடியார்   - அறிவுடைமை

2.பழமொழி நானூறு   - வீட்டு நெறி

3. கார்நாற்பது   - தோழி பருவங்காட்டி தலைமகளை வற்புறுத்திய பாடல்கள்

                            (1முதல் – 18பாடல்கள்)

Unit III   உரைநடை   10 h

1. பெற்றோர்ப் பேணல்   - திரு.வி.க.
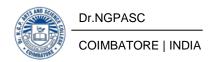
2. உள்ளம் குளிர்ந்தது   - மு.வரதராசனார்

3. சங்கநெறிகள்   - வ.சுப.மாணிக்கம்

Unit IV   உரைநடை   13 h

1.பெரியார் உணர்த்தும்
சுயமரியாதையும் சமதர்மமும்   - வே. ஆனைமுத்து

2. வீரவணக்கம்   - கைலாசபதி

3.மொழியும்நிலமும்   - எஸ். ராமகிருஷ்ணண்

Unit V இலக்கிய வரலாறு, இலக்கணம் மற்றும் பயிற்சிப் பகுதி 15 h

அ.இலக்கிய வரலாறு

1. பதினெண் கீழ்க்கணக்கு நூல்கள்

2. தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும்

ஆ. இலக்கணம்

1. வழு, வழுவமைதி, வழாநிலை

இ. பயிற்சிப் பகுதி

1. நூல் மதிப்பீடு மற்றும் திரைக்கதை திறனாய்வு

2. தன்விவரக் குறிப்பு எழுதுதல்

Note : பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

Text Books

1 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி (தன்னாட்சி) செய்யுள் மற்றும் உரைநடைத் திரட்டு. (முதல்பதிப்பு.) சென்னை: நியூ செஞ்சுரி புக்ஹவுஸ் (பி) லிட்.

References

1 பேராசிரியர் புலவர் இளவரசு, சோம. (ஜூலை2012). தமிழ் இலக்கிய வரலாறு. (எட்டாம் பதிப்பு) சென்னை: மணிவாசகர் பதிப்பகம்.

2 பேராசிரியர் முனைவர் பாக்கியமேரி (2013). இலக்கணம் இலக்கிய வரலாறு மொழித்திறன். (முதல் பதிப்பு) சென்னை பூவேந்தன் பதிப்பகம்.

3 தமிழ் இணையக் கல்விக்கழகம் <http://www.tamilvu.org/>

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2HA	HINDI -II	LANGUAGE	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.

- To learn various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S   Strong   M   Medium   L   Low

201TL1A2HA	HINDI -II	SEMESTER II

Total Credits: 03

Total Instruction Hours: 60 h

Syllabus

Unit I   12 h

आधुनिक पद्य – शबरी (श्री नरेश मेहता

प्रकाशक: लोकभारती प्रकाशन

पहली मंजिल, दरबारी बिल्डिंग,

महात्मा गाँधी मार्ग, इलाहाबाद-211001

Unit II   12 h

उपन्यास: सेवासदन-प्रेमचन्द

प्रकाशक: सुमित्र प्रकाशन

204 लीला अपार्ट्मेंट्स, 15 हेस्टिंग्स रोड'

अशोक नगर इलाहाबाद-211001

Unit III   12 h

कहानी-किरीट- डा उषा पाठक / डा अचला पाण्डेय

पाठ 1. उसने कहा था

पाठ 2. कफ़न,

पाठ 3. चीफ़ की दावत

प्रकाशक: राधाकृष्ण प्रकाशन दिल्ली

Unit IV   12 h

पत्र लेखन: (औपचारिक या अनौपचारिक)

पुस्तक: व्याकरण प्रदिप – रामदेव

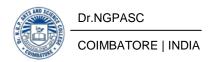प्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024

Unit V   12 h

अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में)

(पाठ 1 to 10)

प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2MA	MALAYALAM - II	LANGUAGE	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To develop the writing ability and develop reading skill.

- To learn various concepts and techniques for criticizing literature, to learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S   Strong   M   Medium   L   Low

201TL1A2MA	MALAYALAM -II	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I   12 h

    Travelogue

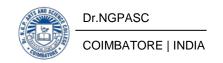**Unit II**   Novel   12 h

    Travelogue

Unit III   14 h

    Travelogue

Unit IV   10 h

    Autobiography

Unit V   12 h

    Autobiography

Text Books

1   Dubai Puzha (Travelogue) By K.Krishna Das, Published by Green books Thrissur.

2   Vazhithirivukal (Autobiography) By Dr.APJ Abdul Kalam Published by DC.Books Kottayam

.

Course Code	Course Name	Category	L	T	P	Credit
201TL1A2FA	FRENCH -II	LANGUAGE	4	1	-	3

PREAMBLE

This course has been designed for students to learn and understand

- To Acquire Competence in General Communication Skills – Oral + Written – Comprehension & Expression.

- To Introduce the Culture, life style and the civilization aspects of the French people as well as of France.

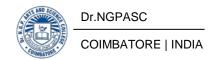- To help the students to acquire Competency in translating simple French sentences into English and vice versa.

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	To learn the adjectives and the classroom environment in France.	K2
CO3	Learn the Plural, Articles and the Hobbies.	K3
CO4	To learn the Cultural Activity in France.	K3
CO5	To learn 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	S	M	M	M	S
CO2	S	M	M	M	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S   Strong   M   Medium   L   Low

201TL1A2FA	FRENCH -II	SEMESTER II

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I   12 h

• Proposer, accepter, refuserune invitation. • Indiquer la date.	Organiser une soirée au cinéma avec des amis, par téléphone et par courriel.	• Comprendreunemessage d'invitationsurunrépondeurt éléphonique. • Inviter quelqu'un accepter ourefuserl'invitation.

Unit II   12 h

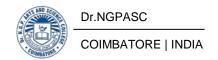|		
• Prendreet fixer un rendez-vous. • Demander etindiquerl'heure.	Organiser une soirée au cinéma avec des amis, par téléphone et par courriel.	• Comprendre des personnes qui fixentunrendez-vous par téléphonique. • Prendreun rendez-vous par telephone

Unit III   12 h

• Exprimer son point de vuepositifetnégatif. • S'informersur le prix. • S'informersur la quantitité. • Exprimer la quantitité.	En groupes, choisir un cadeau pour un ami.	• Exprimer son point de vuesur des idées de cadeau. • Faire des achatsdans un magasin

Unit IV   12 h

• Demander etindiquerune direction. • Localiser (près de, en face de ….).	Suivre un itinéraire à l'aided'indications par telephone et d'un plan.	• Comprendre des indications de direction. • Comprendre des indications de lieu.

Unit V   12 h

• Exprimerl'obligationl'int erdit. • Conseiller.	Par courrierélectronique, donner des informations et des conseils à un ami qui veut voyager.	• Comprendreune chanson. • Comprendre de courts messages qui experiment l'obligationoul'interdiction • Donner des conseils à des personnesdans des situations données.

Text Books

| 1 | LATITUDES 1 (Méthode de français) Pages from 56 to 101, Author : RÉGINE MÉRIEUX Publisher : GOYAL Publishers & Distributors Pvt |

Course Code	Course Name	Category	L	T	P	Credit
211EL1A2EA	PROFESSIONAL ENGLISH - II	LANGUAGE	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
- The vocabulary and to frame sentence structure
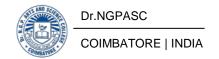- The transactional concept of English language

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Interpret skills in communication and to shape their attitude	K2
CO2	Develop oral and written language skills in a business context	K3
CO3	Analyze to gain key strategies and expressions for communicating with professionals	K3
CO4	Inspect the knowledge to the corporate needs	K4
CO5	Formulate Inter and Intrapersonal skills	K5

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

211EL1A2EA	**PROFESSIONAL ENGLISH - II**	**SEMESTER II**

Total Credits: 3

Total Instruction Hours: 60 h

Syllabus

Unit I   Technical English   12 h

Communication: Process- Methods- Channels- Barriers of Communications

Phonetics: Basics of phonetics - Consonants and Vowel sounds

Reading Skills: Skimming and Scanning- Reading Different Kinds of Texts- Types- Developing a Good Reading Speed

Writing Skills: Note- Making and note taking, Paragraph Writing: Structure and principles

Unit II   Business English   12 h

Structure and Planning of Letters: Elements of Structure- Forms of Layout- Style- Writing Business Letters

Quotation, Order and Tender: Inviting - Sending Quotation letter - Placing Orders- Inviting Tenders

E-mail Correspondence: Structure- Procedure- Style- Guidelines- Jargon and Acronyms- Security Precaution

Seminar and Meetings: Introduction- Organizing a Seminar- Sample Brochure- Conducting and Participating in a Meeting

Unit III   Professional English   12 h

Report Writing: Importance- Process- Types- Structure

Memo: Importance- Structure

Notice, Agenda and Minutes: Meeting- Notice- Agenda- Minutes: Preparation- Structure- Delivery

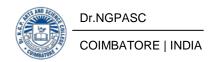Brochures: Purpose- Audience- Qualities

Unit IV   Employment Communication   12 h

Resume Writing : Elements of Resume - difference between CV and Resume - Writing Job Application
Art of Conversation: Small Talk- Body Language- Principles of Good Conversation
Interview: Organizational role- Goals- Types- Interview Process
Group Discussion: Importance- Features- Strategies- Barriers

Unit V   Soft Skills   12 h

Self - Discovery and Goal Setting: Self - Discovery - Goals and Types- Benefits, Areas and Clarity of Goal Setting

Positive Thinking (PT) and Attitude: Benefits of PT and Attitude- Develop Positive Attitude and Thinking- Drive out Negative Thinking and Attitude

Etiquettes and Manners: Home, Table and Business, Time Management

Text Books

1 Prabha, Dr. R. Vithya & S. Nithya Devi. 2019. Sparkle. (1st Edn.) McGraw - Hill Education. Chennai. [Unit I - V]

References

1 Ghosh, B.N. Editor. 2017. Managing Soft Skills for Personality Development. McGraw - Hill Education, Chennai.

2 Adams, Katherine L. and Gloria I. Galanes. 2018. Communicating in Groups- Applications and Skills. McGraw - Hill Education, Chennai.

3 Koneru, Aruna. 2017.   Professional Communication. McGraw - Hill Education, Chennai.

4 Koneru, Aruna. 2011. English Language Skills. McGraw - Hill Education, Chennai.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A2CA	**DATA STRUCTURES AND ALGORITHMS**	CORE	4	1	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept of data structures hierarchy.
- The basic and higher order data structures.
- The concept of data structures to various real-time applications.

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.	K2
CO2	Classify the types of data structures based on operations.	K2
CO3	Apply nonlinear data structures in real-life applications	K3
CO4	Solve problems using the searching and sorting algorithms.	K3
CO5	Categorize the various file organizations based their operations.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

214AI1A2CA	DATA STRUCTURES AND ALGORITHMS	SEMESTER II

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I   Introduction : Algorithms, Array, Stack and Queue   12 h

Introduction to algorithms - Definition - Properties - Development of Algorithms - Data Structures - Definition - Classification- Analysis of Algorithms - Asymptotic Notations. Arrays: Representation of Arrays - Operations - Applications - Stack - Stack operations - Applications - Queue - Queue Operations - Applications.

Unit II   Linked List   12 h

Introduction - Logical representation of linked list -Linked list operations - Types of linked lists -Singly linked list -Doubly linked lists - Circular linked lists - Linked stacks and queues - polynomial addition - - Dynamic Storage Management - Garbage collection and compaction.

Unit III   Trees and Graphs   12 h

Trees: Definition - Basic Terminologies -Representation of trees - Binary Trees - Binary Tree representations - Types of binary trees - Binary Tree Traversal - Threaded Binary trees - Applications. Graphs: Definition and Basic Terminologies - Representations of Graphs - Graph Traversals - Applications.

Unit IV   Hash Tables , Searching and External sorting   12 h

Introduction - Hash Table Structure - Hash Functions - Linear Open Addressing - Chaining - Applications. Searching - Linear search - Binary Search - External sorting: External sorting methods - Storage Devices - sorting with Disks - K-way merging - sorting with tapes.

Unit V   Internal sorting and Files   12 h

Introduction - Bubble sort -Insertion sort - Selection sort - Quick sort - 2-way Merge sort - Heap sort - Shell sort - sorting on keys. Files: Files - Basic File Operations - Heap - Sequential file organizations - Indexed Sequential file Organization - Direct File organization.

Text Books

1. Vijayalakshmi Pai, G A, 2009, "Data Structures and Algorithms", 1st Edition, TMH.

References

1. Ellis Horowitz, Sartaj Shani, 2010, "Data Structures", 3rd Edition, Galgotia Publication

2. Malik D S, 2003,"Data Structures using C", (1st Edn.), Cengage Learning.

3. Varsha H. Patil, 2012, "Data Structures using C", 1st Edition , Oxford Higher Education.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A2CB	**OPERATING SYSTEMS**	**CORE**	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The main components and their functions of Operating Systems.
- The concept of process management, scheduling, IPC and Deadlocks.
- The need for special purpose operating systems.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize the components of an OS and their functions.	K1
CO2	Understand the CPU process management policies.	K2
CO3	Apply the scheduling algorithms for CPU scheduling.	K3
CO4	Analyze the various memory management policies.	K4
CO5	Articulate the various Input and Output management policies.	K4

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

214AI1A2CB	OPERATING SYSTEMS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to Operating Systems   10 h

Introduction - history of operating system-processors - computer hardware - memory - disk - input and output devices - buses - different kinds of operating system – Operating system concepts - System calls-Operating system structure - monolithic - layered - microkernel - client/server models - virtual machines.

Unit II   Processes & Threads   10 h

Processes -process model -process creation - process termination -process hierarchies - process states- threads - thread model and usage- classical thread model- inter process communication - race conditions - critical regions - mutual exclusion - semaphores.

Unit III   Scheduling and Memory Management   10 h

Introduction to scheduling - scheduling in batch systems - interactive systems -real-time systems - Memory Abstraction -notion of an address space -swapping - managing free space - Virtual Memory - Page replacement algorithms - design issues for paging systems - segmentation.

Unit IV   Deadlocks   9 h

Resources- introduction to deadlocks - conditions for deadlocks-deadlock modeling - deadlock detection and recovery - deadlocks avoidance - deadlock prevention. Multiple processor system: multiprocessors -hardware's - operating system types synchronization - scheduling - multi computers -distributed systems.

Unit V   I/O Management   9 h

Principles of I/O hardware -I/O devices - device controllers -memory mapped I/O - DMA - principles of I/O software - goals of I/O software-programmed I/O - interrupt -driven I/O - Files systems: Files - directories - files systems implementation - File System Management and Optimization.

Text Books

1   Andrew S. Tanenbaum, 2015, "Modern Operating Systems", 4th Edition, PHI New Delhi.

References

1   William Stallings, 2018, "Operating Systems - Internals & Design Principles", (9th Edition, PHI private Ltd, New Delhi.

2   Sridhar Vaidyanathan, 2014, "Operating System", 1st Edition, Vijay Nicole Publications.

3   Abraham Silberschatz, Greg Gagne, Peter B. Galvin, 2018, "Operating Systems Concepts", 10th Edition, John Wiley.
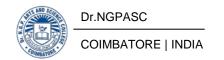
214AI1A2CP	CORE PRACTICAL: DATA STRUCTURES USING C	SEMESTER II

Total Credits: 2
Total Instructions Hours: 48 h

S.No	List of Experiments
1	Implement the Stack Operations using arrays.
2	Demonstrate the Queue Operations using arrays.
3	Program for Infix to Postfix conversion.
4	Create a Singly Linked list and perform insertion and deletion.
5	Implement the Linear Search Algorithm.
6	Implement the Binary Search Algorithm.
7	Design a C program for Insertion Sort.
8	Develop a C program for Merge Sort.
9	Program to implement Quick Sort
10	Implement Heap Sort using C.
11	Program to implement the Breath First Search.
12	Implementation of Depth First Search.

Note: Out of 12-10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
212MT1A2IE	**PROBABILITY AND STATISTICS**	IDC	4	1	-	4

PREAMBLE

This course has been designed for students to learn and understand

- Basic concepts of Probability theory
- Apply the concepts to solve the probability problems
- Concepts of Regression and Correlation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the concept of probability theory	K2
CO2	Identify the problem-solving random variable and probability function	K3
CO3	Apply the knowledge of Probability distribution	K4
CO4	Identify the sampling distributions	K4
CO5	Interpret the concept of correlation and regression	K6

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	S
CO2	L	S	S	M	S
CO3	L	M	S	M	M
CO4	M	S	M	S	S
CO5	M	S	M	S	S

S　　　**Strong**　　**M**　　　**Medium**　　**L**　　　**Low**

212MT1A2IE	**PROBABILITY AND STATISTICS**	**SEMESTER II**

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Probability 12 h

Introduction- Sample spaces- Events- The probability of events-Some rules of probability- Conditional probability- Independent Events- Bayes theorem- The theory and practice.

Unit II Random Vzariable 12 h

The expected value of a random variable –Moments –Chebyshev's theorem - Moment Generating Function-Product of moments- Moments of linear combinations of random variables-Conditional expectations- The theory and practice

Unit III Special Probability Distribution 14 h

The Discrete uniform, Binomial, Poisson, Hyper Geometric, Geometric and Negative Binomial distributions. Special Probability Densities: Uniform , Normal , Exponential, Gamma, Beta and Bivariate normal distributions.

Unit IV Sampling Distribution 10 h

The distribution of the mean – Finite populations- The chi-square distribution – The t distribution- The F distribution- Order Statistics- The theory and practice.

Unit V Regression and Correlation 12 h

Introduction- Linear regression- The method of Least squares-Normal Regression Analysis- Normal Correlation Analysis- Multiple Linear regression- The theory and practice.

Text Books

1 John E. Freund's, 2018, "Mathematical Statistics with Applications", 8th Edition, Prentice Hall of India, New Delhi

References

1 Robert. V. Hogg and Allen T.G. Craig, 2006, "Introduction to Mathematical Statistics", 5th edition, Pearson Education.

2 Suddhebdu Biswas and G.L. Sriwastav, "Mathematical Statistics", 1st Edition, Narosa Publishing House Pvt. India.

3 Nabebdu Pal and Sahadeb Sarkar, "Statistics", 2nd Edition, Prentice Hall of India, New Delhi

4 Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye, 2006, "Probability and Statistics for Engineers and Scientists:, 9th edition, Pearson Education.

Course Code	Course Name	Category	L	T	P	Credit
196BM1A2AA	HUMAN RIGHTS	AECC	2	-	-	2

PREAMBLE

This course has been designed for students to learn and understand

- To study how human values and personality traits help to develop the characteristics of each individual
- Understanding the moral values towards the enrichment of the society
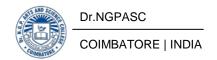- Identify the impact of ethics and values on the global development of the current scenario

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 human values, personality traits and character formation.	K2
CO2	Acquire the knowledge through value education towards national and global development.	K1
CO3	Introduce the basic concepts of conflict, emotions and adolescent emotions.	K1
CO4	Illustrate the techniques in therapeutic measures like yoga and meditation.	K2
CO5	Learn the concepts of human rights, rights for women and children and domestic violence.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

196BM1A2AA	HUMAN RIGHTS	SEMESTER II

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I   Introduction to Human Values   05 h

Concept of Human Values - Value Education Towards Personal Development - Aim of education and value education - Evolution of value oriented education - Concept of Human values - Types of values - Components of value education - Personal Development: Self analysis and introspection - Sensitization towards gender equality - Physically challenged - Intellectually challenged - Respect to age - Experience - Maturity - Family members - Neighbours - Co-workers - Character Formation towards Positive Personality: Truthfulness - Constructivity - Sacrifice - Sincerity - Self Control - Altruism - Tolerance - Scientific Vision.

Unit II   Value Education and Social Values   05 h

Value Education Towards National and Global Development National and International Values: Constitutional or national values - Democracy - Socialism - Secularism - Equality - Justice - Liberty - Freedom and fraternity -Social Values - Pity and probity - Self control - Universal brotherhood - Professional Values - Knowledge thirst - Sincerity in profession - Regularity - Punctuality and faith - Religious Values - Tolerance - Wisdom - Character - Aesthetic values - Love and appreciation of literature and fine arts and respect for the same - National Integration and international understanding.

Unit III   Global Development on Ethics and Values   04 h

Impact of Global Development on Ethics and Values: Conflict of cross-cultural influences - Mass media - Cross-border education - Materialistic values - Professional challenges and compromise - Modern Challenges of Adolescent Emotions and behave or Sex and spirituality: Comparison and competition - Positive and negative thoughts - Adolescent Emotions - Arrogance - Anger - Sexual instability - Selfishness - defiance.

Unit IV   Yoga and Meditation   05 h

Therapeutic Measures: Control of the mind through - Simplified physical exercise - Meditation – Objectives - Types - Effect on body - Mind - Soul - Yoga – Objectives - Types - Asanas - Activities: Moralisation of Desires -Neutralisation of Anger - Eradication of Worries - Benefits of Blessings.

Unit V   Human Rights and Rights of Women and Children   05 h

Human Rights - Concept of Human Rights – Indian and International Perspectives - Evolution of Human Rights - Definitions under Indian and International documents - Broad classification of Human Rights and Relevant Constitutional Provisions - Right to Life - Liberty and Dignity - Right to Equality - Right against Exploitation - Cultural and Educational Rights - Economic Rights - Political Rights - Social Rights - Human Rights of Women and Children - Social Practice and Constitutional Safeguards - Female Foeticide and Infanticide - Physical assault and harassment - Domestic violence - Conditions of Working Women - Institutions for Implementation - Human Rights Commission - Judiciary - Violations and Redressel Violation by State - Violation by Individuals - Nuclear Weapons and Terrorism Safeguards.

References

1   Brain Trust Aliyar, 2008, Value Education for health, happiness and harmony. Vethathiri publications, Erode

2   Grose. D. N, 2005, A text book of Value Education. Dominant Publishers and Distributors, New Delhi.

3   Yogesh Kumar Singh & Ruchika Nath, 2005, Value Education, P. H Publishing Corporation, New Delhi.

4   Venkataram & Sandhiya. N, 2001, Research in Value Education, APH Publishing Corporation, New Delhi.

5   Seetharam. R. (Ed), 1998, Becoming a better Teacher Madras Academic Staff College.

6   Brain Trust Aliyar, 2004, Value Education for Health, Happiness and Harmony. Vethathiri publications, Erode.

7   Swami Vivekananda, 2008, Personality Development. Advaita Ashrama, Kolkata.

8   Dey A. K, 2002, Environmental Chemistry. New Delhi – Vile Dasaus Ltd.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A3CA	CORE - IV: RELATIONAL DATA BASE MANAGEMENT SYSTEMS	CORE	4	1	0	4

PREAMBLE

This course has been designed for students to learn and understand

- To the foundations of of database management systems.

- To give a good formal foundation on the relational model of data.

- To use the database management systems in various real-time applications.

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 database systems.	K2
CO2	Demonstrate the basics of SQL for database	K2
CO3	Execute various advanced SQL queries.	K3
CO4	Apply various normalization techniques on databases.	K3
CO5	Apply and relate the concept of transaction, concurrency control and recovery in database.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

214AI1A3CA	CORE : RELATIONAL DATABASE MANAGEMENT SYSTEMS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I Introduction 12 h

Database System Applications-DBMS Vs. File System - View of Data-Data Model Database Languages - Database users and Administrators - Transaction Management - Database System Structure - Application Architecture. Data Models: Basic Concepts - Constraint- Keys- ER Diagram -Relational Model: Structure of Relational Databases - Relational Algebra.

Unit II SQL 12 h

Background-Basic Structure-Set Operation-Aggregate Function-Null Values-Nested Sub Queries - Views - Modification of the Database -Database Languages: Data Definition Languages - Data Manipulation Languages - Data Control Languages - Transaction Control Languages - Embedded SQL - Dynamic SQL.

Unit III Advanced SQL 12 h

Integrity and Security: Introduction - Domain Integrity - Constraint - Referential Integrity - assertions - Triggers - creation of triggers - Views - View creation - Security and Authorization - Authorization in SQL - Encryption and Authentication- Database Encryption Techniques.

Unit IV Relational Database Design 12 h

Introduction - Pitfalls in Relational Database Design-Functional Dependencies -First Normal Form - Second Normal Form - Boyce-Codd Normal Form - Third Normal Form - Fourth Normal Form - Overall Database Design Process.

Unit V Transaction Management 12 h

Transaction concepts - States - Serializability- Lock based concurrency control: Locks - Granting - Two-Phase Locking protocol. Time stamp based protocol: Timestamps - Timestamp ordering protocol - Dead lock handling.

Text Books

1   A Silberschatz, H Korth, S Sudarshan, (2005), "Database System and Concepts", (5th Edn.) TMH.

References

1   Alexix Leon & Mathews Leon, (2009), "Essential of DBMS", (2nd Edn.), Vijay Nicole Publications.

2   Alexix Leon & Mathews Leon,(2014), "Fundamentals of DBMS",(2nd Edn.), Vijay Nicole Publications.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A3CB	CORE - V : FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	CORE	4	1	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental concepts of Artificial Intelligence and its applications.
- The basics of knowledge representation and Reasoning.
- The fundamental issues and challenges in AI.

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 artificial intelligence.	K2
CO2	Apply the heuristic search techniques and reasoning for problem solving.	K3
CO3	Apply the various techniques for knowledge representation.	K3
CO4	Understand the fundamental aspects of Game playing.	K2
CO5	Apply the appropriate AI techniques for the given problem	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

214AI1A3CB	CORE : FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	SEMESTER III

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I   Introduction to AI   12 h

Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents –Typical Intelligent Agents – Problem Solving Approach to Typical AI Problems.

Unit II   Problem Solving Methods   12 h

Problem Solving Methods – Search Strategies – Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games.

Unit III   Knowledge Representation   12 h

Knowledge Representation – First Order Predicate Logic – Prolog Programming – Unification –Forward Chaining – Backward – Chaining – Resolution – Knowledge Representation – Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information.

Unit IV   Software Agents   12 h

Software Agents – Architecture for Intelligent Agents – Agent Communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent Systems.

Unit V   AI Applications   12 h

AI Applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning - Moving.

Text Books

1. Stuart Russel and Peter Norvig,(2009), "Artificial Intelligence – A modern approach",(2nd Edn.), Prentice Hall

2. I. Bratko, (2011)"Prolog: Programming for Artificial Intelligence", (4th Edn.), Addison-Wesley Educational Publishers Inc.

References

1. Prachi Joshi, and Parag Kulkarni, (2012), "Artificial Intelligence: Building Intelligent Systems", (2nd Edn.), MIT Press.

2. Elaine Rich, Kevin Knight and Shiva shankar B Nair, (2010), "Artificial Intelligence", (3rd Edn.)TMH.

214AI1A3CP	CORE **PRACTICAL:** SQL - PL/SQL	SEMESTER-III

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Draw E-R diagram and convert entities and relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college).
2	To implement the DDL Commands.
3	Implementation of the DDL Commands with Key Constraints.
4	To Implement the DML Commands.
5	Implementation of DCL Commands and Views.
6	Write a PL/SQL program to check whether a number is even or odd.
7	Design a PL/SQL block of code for reversing a number. (Example: 1234 as 4321).
8	Design a PL/SQL block to calculate the incentive of an employee whose ID is 110.
9	Write a PL/SQL program to check whether a given number is positive, negative or zero.
10	Write a PL/SQL program using FOR loop to insert ten rows into a database table.
11	Write a PL/SQL program to check whether a given character is letter or digit.
12	Write a PL/SQL code block to calculate the area of the circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in a table Areas. Areas – radius, area.

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
212PY1A3IB	IDC III : DIGITAL COMPUTER FUNDAMENTALS	IDC	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The digital circuit design and analysis.
- The working principle behind digital electronic devices.
- The fundamentals of computers and peripherals.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the various number systems and codes.	K2
CO2	Identify the logic gates and their functionality.	K2
CO3	Design basic electronic circuits.	K3
CO4	Illustrate the memory concepts, I/O devices and peripherals.	K2
CO5	Understand the basics of computer configurations.	K2

MAPPING WITH PROGRAMME OUTCOMES

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

S   **Strong**   **M**   **Medium**   **L**   **Low**

212PY1A3IB	IDC III : DIGITAL COMPUTER FUNDAMENTALS	SEMESTER III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Number system   10 h

Number System – Converting numbers from one base to another – Complements – Binary Codes – Integrated Circuits – Boolean algebra – Properties of Boolean algebra – Boolean functions – Canonical and Standard forms – Logical Operations – Logic gates – Karnaugh Map simplifications – Don't Care Condition –– Tabulation Method.

Unit II   Adder and Subtractor   10 h

Adder – Subtractor – Code Converter – Analyzing a combinational Circuit – Multilevel NAND and NOR circuits – Properties of XOR and equivalence functions – Binary Parallel Adder – Decimal Adder – Magnitude Comparator – Decoders – Multiplexers – ROM – PLA.

Unit III   Flip Flops   10 h

Flip Flops – types of flip-flops -Triggering of flip-flops – Analyzing a sequential circuit – State reduction – excitation tables – Design of sequential circuits – Counters – Design with state equation – Registers – Shift Registers – Ripple and synchronous Counters.

Unit IV   Memory and Bus Organization   9 h

Introduction - Types of Memory - Memory Unit – Bus Organization – Scratch Pad memory – ALU – Design of ALU – Status Register – Effects of Output carry – Design of Shifter – Processor Unit – Microprogramming – Design of specific Arithmetic Circuits.

Unit V   Accumulator and Instruction sets   9 h

Introduction - Accumulator – Design of Accumulator – Computer Configuration – Instruction and Data formats – Instruction sets – Timing and Control – Execution of Instruction – Design of Computer – Hardwired control – PLA Control and Microprogram control.

Text Books

1. M. Morris Mano, (1994), "Digital Logic and computer Design", (2nd Edn.),PHI, New Delhi.

2. M. M. Mano and C.R.Kime, (2001), "Logic and Computer Design Fundamentals", (2nd Edn.), Pearson Education, Delhi.

References

1. Givone, (2002), "Digital Principles Design",(1st Edn.), Tata McGraw Hill, New Delhi.

2. C. H. Roth , Jr, (2005), "Fundamentals of Logic Design" ,(5th Edn.), Thomson Learning, Singapore.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A3SA	SEC I: PROGRAMMING IN JAVA	SEC	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic programming constructs of Java Language.
- To explore the features of Java by coding.
- To design and develop real-time Java applications.

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 Java Language.	K2
CO2	Apply the basic object oriented principles in programming.	K3
CO3	Apply the principles of inheritance, packages and interfaces.	K3
CO4	Use exceptions, applets, graphics programming for real world problems.	K3
CO5	Demonstrate the working features of files.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

214AI1A3SA	SEC I: PROGRAMMING IN JAVA	**SEMESTER** III

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Genesis of Java   10 h

Creation of Java – why java is important to internet – The Java Buzz words – An overview of Java Object Oriented Programming. Data types – Variables – Type conversion and casting – Automatic type promotion in Expressions – Strings. Arrays: One Dimensional Array – Multi Dimensional Array – Operators – Control statements.

Unit II   Class Fundamentals   10 h

Class Fundamentals – Declaring objects – Assigning object Reference variables – Introducing Methods – Constructors – Garbage collection – Finalize () Method – Overloading Methods – Argument passing – Nested and Inner classes – String class – Using command line arguments. Inheritance Basics & Types - Method overriding – Dynamic Method Dispatch – Using Abstract class – Using final with inheritance.

Unit III   Packages, Interfaces and Threads   10 h

Packages & Interface - Exception Handling - Creating your own Exception subclasses. Multithreaded Programming: Java Thread Model – Main Thread – Creating a Thread - Creating Multiple Threads–Using is Alive () and join () – Thread priorities – Synchronization – Inter thread Communication.

Unit IV   I/O & Applets   9 h

I/O Basics Reading console Input – writing console output – The Print Writer class – Reading and Writing Files. The Applet class: - Applet Architecture – Applet Skeleton – Applet Display method – Requesting Repainting – HTML APPLET tag- Passing Parameters to Applet – Audio Clip Interface. Event Handling Mechanisms.

Unit V   AWT Classes   9 h

Window fundamentals – working with Frame Windows - working with Graphic Using AWT controls: Controls fundamentals – Labels – using Buttons – Applying check Boxes – Check Box group – Choice controls – Using a Text field – Using a Text Area – Understanding Layout Managers (Flow Layout only) – Menu Bars and Menus.

Text Books

1. Herbert Schildt,(2014), "Java - The Complete Reference", (9th Edn.), McGraw-Hill Education

References

1. E. Balagurusamy, (2014), "Programming with Java",(3rd Edn.), TMH.

2. Sachin Malhotra & Saurabh Choudhary, "Programming in JAVA", (2nd Edn), Oxford Press.

3. Sagayaraj, Denis, Karthik and Gajalakshmi, (2018), "JAVA Programming for Core and Advanced Learners"

214AI1A3SP	**SEC PRACTICAL:** JAVA PROGRAMMING	**SEMESTER**- III

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Programs on classes, objects, constructor and parameterized constructors.
2	To implement the Method overloading, constructor overloading.
3	Develop Java programs for Single level & Multi level inheritance.
4	Program to implement Arrays in Java.
5	To implement the Abstract classes and Interfaces.
6	Develop a Java program for Exception handling.
7	Implement Packages in Java.
8	Demonstrate the concept of Multithreading in Java.
9	Implement the Scanner classes in Java.
10	Demonstrate I/O & File Handling in Java.
11	Program to illustrate Mouse Event Handling in Java.
12	Java program to create a file menu with option New, Save and Close, Edit menu with option cut, copy, and paste.

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
214AI1A3GA	GENERIC ELECTIVE: APPLIED ARTIFICIAL INTELLIGENCE	GE	2	0	0	2

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental concepts of Artificial Intelligence.
- The promises and challenges of Artificial Intelligence.
- The development of AI Strategies and Enterprise functions.

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 Artificial Intelligence.	K2
CO2	Describe the Promises and Challenges of AI.	K3
CO3	Develop an Enterprise AI Strategy.	K3
CO4	Build Machine Learning Models for an enterprise.	K3
CO5	Apply AI for Enterprise Functions.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S Strong   M Medium   L Low

214AI1A3GA	GENERIC ELECTIVE: APPLIED ARTIFICIAL INTELLIGENCE	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I   Foundations of AI   5 h

Basic Terminologies of AI - AI vs AGI - Modern AI Techniques - Machine Intelligence - Systems that Act - Systems that Predict - Systems that Learn - Systems that Create - Systems that Relate - Systems that Master - Systems that Evolve.

Unit II   Promises and Challenges of Artificial Intelligence   4 h

Microfinance - Social Justice - Medical Diagnosis - The Effects of Discrimination - Malicious AI - Designing Safe and Ethical AI - Ethics and Governance - Education as Remedy - Collaborative Design.

Unit III   Develop an Enterprise AI Strategy   5 h

Build an AI-Ready Culture - Build An Enterprise-Wide Case For AI -Invest in a technical talent - Understand Different Job Titles - Seek the Right Characteristics - Optimize Recruiting Strategies - Plan your implementation - Collect and prepare Data.

Unit IV   Build Machine Learning Models   5 h

AI Is Not a Silver Bullet -Assessing the Performance of Your Models -Common Mistakes With Machine Learning Models -Machine Learning Workflow -Maintain an Experimental Mindset - Agile Development -Technical Debt -Deployment and Scaling -Iteration and Improvement

Unit V   AI for Enterprise Functions   5 h

Obstacles and Opportunities - General and Administrative functions - Human Resources and Talents - Business Intelligence and Analytics - Software Development - Marketing - Sales - Customer Support - Ethics of Enterprise AI.

Text Books

1   Mariya Yao, Adelyn Zhou, Marlene Jia (2018), ” Applied Artificial Intelligence: A Handbook For Business Leaders”,(Kindle Edn.)

References

1   Stuart Russel and Peter Norvig,(2009), “Artificial Intelligence – A modern approach”,(2nd Edn.), Prentice Hall.

2   Prachi Joshi, and Parag Kulkarni, (2012), “Artificial Intelligence: Building Intelligent Systems”, (2nd Edn.), MIT Press.

191TLIA3AA	பகுதி – 4 : அடிப்படைத்தமிழ்தாள் : 1(Basic Tamil)	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019–20ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது (10 மற்றும் 12 – ஆம் வகுப்பு வரை தமிழ் மொழிப்பாடம் பயிலாதவர்களுக்கு) (பருவத் தேர்வு உண்டு)

அலகு : 1   தமிழ் மொழியின் அடிப்படைக் கூறுகள்   12 h

அ) எழுத்துகள் அறிமுகம் :

1. உயிர் எழுத்துக்கள் - குறில் , நெடில் எழுத்துகள்
2. மெய் எழுத்துக்கள் - வல்லினம், மெல்லினம், இடையினம்
3. உயிர்மெய் எழுத்துக்கள்

ஆ) சொற்களின் அறிமுகம்: பெயர்ச்சொல், வினைச்சொல் – விளக்கம் (எ.கா.)

அலகு : 2   குறிப்பு எழுதுதல்   12 h

1. பெயர், முகவரி, பாடப்பிரிவு , கல்லூரியின் முகவரி
2. தமிழ் மாதங்கள்(12), வாரநாட்கள்(7),
3. எண்கள் (ஒன்று முதல் பத்து வரை), வடிவங்கள், வண்ணங்கள்
4. ஊர்வன, பறப்பன, விலங்குகள், மனிதர்களின் உறவுப்பெயர்கள்
5. ஊர்களின்பெயர்கள் (எண்ணிக்கை 10)
6. பயிற்சிப் பகுதி (உரையாடும் இடங்கள்) : வகுப்பறை, பேருந்து நிலையம், சந்தை

வினாத்தாள் அமைப்பு முறை   -   மொத்த மதிப்பெண்கள் - 100

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல்   10x2=20

பகுதி –ஆ

சரியா? தவறா? தேர்ந்தெடுத்து எழுதுக .   10x2=20

பகுதி-இ

ஒரு பக்க அளவில் விடையளிக்க   03x20=60

குறிப்பு:

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

Text Books

1. அடிப்படைத் தமிழ். 2019. தொகுப்பு : தமிழ்த் துறை, டாக்டர் என். ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை

References

1. ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம்

2. வலைதள முகவரி : http://tamilvu.org

191TLIA3AB	பகுதி – 4 : சிறப்புத் தமிழ் தாள் : 1 (Advanced Tamil)	SEMESTER - III

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019– 2020 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது (10 மற்றும் 12 – ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது)(பருவத் தேர்வு உண்டு)

அலகு – 1   மரபுக் கவிதைகள்   05 h

அ) பாரதியார் கவிதைகள்

- தமிழ்நாடு
- மனதில் உறுதி வேண்டும்
- வருகின்ற பாரதம் (பா.எண்.5-8)

ஆ) பாரதிதாசன் கவிதைகள்

- இன்பத்தமிழ்
- நீங்களே சொல்லுங்கள்
- வாளினை எடடா!

இ) தாராபாரதி கவிதைகள்

- வேலைகளல்ல வேள்விகள்

அலகு – 2   புதுக்கவிதைகள்   05 h

- கம்பன் கவியரங்கக் கவிதை - மு.மேத்தா
- தமிழா! நீ பேசுவது தமிழா! - காசியானந்தன்
- நட்புக் காலம் (10 கவிதைகள்) - அறிவுமதி கவிதைகள்

அலகு – 3   இலக்கணம்   04 h

- வல்லினம் மிகும் மற்றும் மிகா இடங்கள்
- ர, ற,- ல, ழ, எ - ந, ண, ன - ஒலிப்பு நெறி, பொருள் வேறுபாடு அறிதல்

அலகு – 4   கடிதங்கள் எழுதுதல்   05 h

- பாராட்டுக் கடிதம்
- நன்றிக் கடிதம்
- அழைப்புக் கடிதம்
- அலுவலக விண்ணப்பங்கள்

அலகு – 5   பாடம் தழுவிய வரலாறு   05 h

- பாரதியாரின் இலக்கியப் பணி
- பாரதிதாசனின் இலக்கியப்பணி
- மரபுக்கவிதை, புதுக்கவிதை - விளக்கம்

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 100

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல் 10x2=20

பகுதி –ஆ

கோடிட்ட இடங்களை நிரப்புக. 10x2=20

பகுதி –இ

இரண்டு பக்க அளவில் விடையளிக்க 4x15=60

குறிப்பு:

- பகுதி –அ அனைத்து அலகுகளில் இருந்தும் இரண்டு வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ –க்கான வினாக்கள் இது அல்லது அது என்ற அடிப்படையில் அந்தந்த அலகுகளில் அமைதல் வேண்டும்

Text Books

1 சிறப்புத் தமிழ் . 2019. தொகுப்பு : தமிழ்த் துறை, டாக்டர் என். ஜி.பி. கலை மற்றும் அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை

References

1 புலவர் சோம. இளவரசு - 2014. இலக்கிய வரலாறு, மணிவாசகர் பதிப்பகம், சென்னை – 108

2 வலைதள முகவரி : http://tamilvu.org

195CR1A3AA	WOMEN'S RIGHTS	SEMESTER III

Total Credits: 2

Total Instruction Hours: 24h

Syllabus

Unit I   Rights to Infant & Child   4 h

Issues for women in India- Law relating to Female infanticide-Rights to the survival of a child-Child Labour- Child trafficking –Child Marriage- Protection of Children against Sexual Offences Act 2012 (POCSO)

Unit II   Rights to women   5 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

Unit III   Laws for Senior Citizen women   5 h

Constitutional Rights –Personal Laws- The Tamil Nadu Maintenance and Welfare of Parents and Senior Citizens Rules in 2009- The National Council for Older person- Government Provisions for elderly persons

Unit IV   Civil and Political Rights of Women   5 h

Right of inheritance-Right to live with decency and dignity-The Married women's Property Act 1874-Personl law 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

Unit V   International convention on Womens' Right   5 h

Convention on the Elimination of All Forms of Discrimination against Women(CEDAW)-United Nations population Fund(UNFPA)-Protocol to the African Charter on the rights of women in Africa-Convention on the Nationality of Married women-Convention on the political rights of women- Inter-American convention on granting of civil and political rights for women-Universal declaration of Human rights

Text Books

1   Women & Law(2009)-Krishna Pal Malik-Allahabad Law University, Delhi

References

1   Women's Human Rights in India(2019)-Christian Foster and Jaya Sagade- Routledge India

2   Justice for Women: Concerns and Expressions (2008)-Anand AS –Universal Law Publishing Co.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A4CA	CORE - VI : MACHINE LEARNING TECHNIQUES	CORE	4	1	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental concepts of Machine Learning.
- The various methods and learning algorithms in ML.
- The underlying mathematical relationships within and across ML algorithms.

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 and techniques of Machine Learning.	K2
CO2	Apply the regression, classification & clustering methods.	K3
CO3	Understand the inference and learning algorithms.	K2
CO4	Demonstrate Dimensionality Reduction Techniques	K2
CO5	Recognize the underlying mathematical relationships within and across Machine Learning algorithms	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   **Strong**   **M**   **Medium**   **L**   **Low**

214AI1A4CA	CORE : MACHINE LEARNING TECHNIQUES	SEMESTER IV

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I   Introduction to Machine Learning   12 h

Introduction – Types of Machine Learning – Supervised Learning – The Brain and the Neuron –Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task –Concept Learning as Search- Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Regression.

Unit II   Machine Learning Models   12 h

Linear Models – Multi-Layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-Layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

Unit III   Tree and Probabilistic Model   12 h

Tree and Probabilistic Models – Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers - Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms –Vector Quantization – Self Organizing Feature Map.

Unit IV   Dimensionality Reduction and Evolutionary Models   12 h

Dimensionality Reduction and Evolutionary Models - Dimensionality Reduction – Linear Discriminant Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization –Evolutionary Learning – Genetic Algorithms – Genetic Offspring – Genetic Operators – Using Genetic Algorithms – Reinforcements Learning – Overview – Getting Lost Example–Markov Decision Process.

Unit V   Graphical Model   12 h

Graphical Models – Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

Text Books

1   Ethem Alpaydin, (2014), "Introduction to Machine Learning (Adaptive Computation and Machine Learning Series", (3rd Edn.), MIT Press.

References

1   Jason Bell, (2014), "- Machine Learning – Hands on for Developers and Technical professionals", (1st Edn.), Wiley.

2   Peter Flach,(2012), "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", (1st Edn.), Cambridge University Press.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A4CB	CORE - VII : PYTHON PROGRAMMING	CORE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The programming basics of python.
- The various functions and error handling methods in python.
- The object oriented features employed in python programming.

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 Python Programming	K2
CO2	Apply the flow control statements, lists and tuples in programming.	K3
CO3	Demonstrate the various built-in functions in python.	K3
CO4	Apply the exception handling mechanisms in program.	K3
CO5	Analyze and apply the various object oriented features in programming.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

214AI1A4CB	CORE : PYTHON PROGRAMMING	**SEMESTER** IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Python Basics   9 h

Python - Variables - Executing Python from the Command Line - Editing Python Files -Python Reserved Words - Basic Syntax-Comments - Standard Data Types – Relational Operators -Logical Operators - Bit Wise Operators - Simple Input and Output.

Unit II   Flow Control Statements, Lists and Tuples   9 h

Control Flow and Syntax - Indenting - if Statement - statements and expressions-string operations- Boolean Expressions -while Loop - break and continue - for Loop. Lists: List-list slices - list methods - list loop–mutability–aliasing - cloning lists - list parameters. Tuples: Tuple assignment-tuple as return value -Sets–Dictionaries.

Unit III   Functions   10 h

Definition - Passing parameters to a Function - Built-in functions- Variable Number of Arguments -Scope – Type conversion-Type coercion-Passing Functions to a Function – Mapping Functions in a Dictionary – Lambda - Modules - Standard Modules – sys – math – time - dir – help Function..

Unit IV   Error Handling   10 h

Run Time Errors - Exception Model - Exception Hierarchy - Handling Multiple Exceptions - Data Streams - Access Modes Writing - Data to a File Reading - Data From a File - Additional File Methods - Using Pipes as Data Streams - Handling I/O Exceptions - Working with Directories.

Unit V   Object Oriented Features   10 h

Classes Principles of Object Orientation - Creating Classes -Instance Methods - File Organization -Special Methods - Class Variables – Inheritance – Polymorphism - Type Identification - Simple Character Matches - Special Characters – Character Classes – Quantifiers - Dot Character - Greedy Matches – Grouping - Matching at Beginning or End - Match Objects – Substituting - Splitting a String - Compiling Regular Expressions.

Text Books

1 Mark Summerfield, (2009), "Programming in Python 3: A Complete introduction to the Python Language", (3rd Edn.), Addison-Wesley Professional.

References

1 Allen B. Downey, (2016), "Think Python: How to Think Like a Computer Scientist Updated for Python 3", (2nd Edn.), O'Reilly Publishers.

2 Guido van Rossum and Fred L. Drake Jr, (2011), "An Introduction to Python – Revised and updated for Python 3.2", (1st Edn.), Network Theory Ltd.

214AI1A4CP	**CORE PRACTICAL:** ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	**SEMESTER**- IV

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Program to resize the image using OpenCV Library.
2	Program to rotate images using OpenCV.
3	Program to drawing functions.
4	Program for Blob Detection.
5	Implement Canny Edge Detection using OpenCV.
6	Program for Template matching in OpenCV.
7	Program for Video capturing using OpenCV.
8	Program for Face recognition and Face detection using the OpenCV.
9	Program to implement the ML - Normal data distribution using Python.
10	Implement the ML - simple linear regression using Python.
11	Implement the ML - multiple regression using Python.
12	Program to implement a ML - Decision tree using Python.

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
213BT1A4IB	IDC IV : BIOINFORMATICS AND TECHNOLOGIES	IDC	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The biological databases and their applications.
- The applications of various tools.
- The biology better in terms of computer algorithms.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understanding biological databases with applications.	K1
CO2	Explain the concept of genomes and gene prediction.	K2
CO3	Distinguish the types of protein structures and its implications in function.	K3
CO4	Comprehend the molecular modelling and visualization for drug designing.	K3
CO5	Comprehend the tools used in Bioinformatics and phylogenetic analysis construction.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   Strong   M   Medium   L   Low

213BT1A4IB	IDC IV : BIOINFORMATICS AND TECHNOLOGIES	**SEMESTER** IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to Bioinformatics   10 h

Basics of Cell-Chromosome-Genome-Genes and DNA-Central Dogma-DNA-Introduction to DNA sequencing-Transcriptomics DNA Microarrays and Proteomics- Biological Databases: DNA sequence Database-Protein Database and Sequence Analysis Tools.

Unit II   Genomics   10 h

Genome Mapping-Assembly and Comparison-Functional Genomics and Transcriptomics and RNA sequencing- Gene Prediction: Computational Methods of Gene Prediction-Methods of Gene Prediction and difficulties of gene prediction.

Unit III   Proteomics   10 h

Introduction to protein structure-Protein Structure Visualization-Comparison and Classification- Protein structure prediction: Protein Secondary Structure Prediction-Protein Tertiary Structure Prediction- Software for Secondary Structure Prediction and methods of protein modeling.

Unit IV   Bioinformatics in Computer-aided Drug Design   9 h

Introduction-The Drug Discovery Process-Structural Bioinformatics in Drug Discovery-SAR and QSAR Techniques in Drug Design-Molecular Docking and AutoDock tools.

Unit V   Applied Bioinformatics Tools   9 h

Introduction to Bioinformatics Tools-Entrez - ExPASy- Sequence Alignment-DNA Sequence Analysis-Protein Sequence Analysis-Pairwise and Multiple Sequence Alignment-Database search-Motif Search (Protein Motifs and Domain Prediction)-Molecular Modeling and Phylogenetic Analysis and Tree Construction.

Text Books

1 S.C. Rastogi , N. Mendiratta and P. Rastogi,(2013), "Bioinformatics: Methods and Applications: Genomics, Proteomics",(4th Edn.), Prentice Hall India Learning Private Limited.

2 Zhumur Ghosh and Bibekan and Mallick,(2009) "Bioinformatics: Principles and Applications", (OUP India; Illustrated 2nd Edn.), Oxford University Press.

References

1 Rui Jiang, Xuegong Zhang and Michael Q. Zhang,(2013), "Basics of Bioinformatics", (1st Edn.),Tsinghua University Press, Beijing and Springer-Verlag Berlin Heidelberg..

2 Teresa Attwood, (2007),"Introduction to Bioinformatics", (1st Edn.),Pearson Education.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A4SA	SEC-II : DATA MINING	SEC	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic concepts of data mining principles and methods.
- The skills of using recent data mining software for solving practical problems.
- To apply the concept of data mining to various real-time applications.

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 data mining.	K2
CO2	Apply the techniques of data classification using various algorithms.	K2
CO3	Explain the concept of prediction in mining data on web.	K3
CO4	Apply various clustering methods for analysis.	K3
CO5	Illustrate the role of data mining techniques in various fields.	K3

MAPPING WITH PROGRAMME OUTCOMES

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

S   **Strong**   **M**   **Medium**   **L**   **Low**

214AI1A4SA	SEC-II : DATA MINING	**SEMESTER** IV

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to Data Mining and Data Preprocessing   10 h

Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction - Data Transformation and Data Discretization.

Unit II   Data Mining, Primitives, Languages and System Architecture   10 h

Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description - Characterization and Comparison: Concept Description-Data Generalization and Summarization-Analytical Characterization-Mining Class Comparison – Statistical Measures.

Unit III   Mining Association Rules   10 h

Basic Concepts – Market basket analysis - Single Dimensional Boolean Association Rules From Transaction Databases- Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses.

Unit IV   Classification and Prediction   9 h

Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods-Prediction – Introduction – Classifier Accuracy.

Unit V   Cluster Analysis   9 h

Introduction – Requirements for cluster analysis - Types of Data in Cluster Analysis-Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method - Evaluation of clustering methods - Advanced clustering methods.

Text Books

1   J.Han and M. Kamber, (2011), "Data Mining Concepts and Techniques", (3rd Edn.), Harcourt India Pvt. Ltd, New Delhi.

References

1   K.P. Soman , Shyam Diwakar, V.Ajay(2003), "Insight into Data Mining Theory and Practice ",(1st Edn.), Prentice Hall of India Pvt. Ltd.

2   Pang-Ning Tan, Michael Steinbach, Vipin Kumar, (2019)" Introduction to Data Mining", (2nd Edn), Pearson Education.

214AI1A4SP	**SEC PRACTICAL:** DATA MINING USING R	**SEMESTER**- IV

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Program to find the factors of a given number.
2	Program to create a list of random numbers in normal distribution and count occurrences of each value.
3	Create a simple bar plot of five subject marks.
4	Design a bell curve of a random normal distribution.
5	Create data frames which contain details of 5 employees and display the details
6	Program to create a correlation matrix from a data frame of same data type.
7	Program to concatenate two given matrices of same column but different rows.
8	Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
9	Plot the histogram, bar chart and pie chart on sample data.
10	Plot the cluster data using R visualizations.
11	To implement Graphs in R Programming.
12	To implement 3D plots in R Programming.

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
214AI1A4GA	GENERIC ELECTIVE: OPEN SOURCE TECHNOLOGY	GE	2	0	0	2

PREAMBLE

This course has been designed for students to learn and understand

* The concept of open source technologies.
* Gain experience using open source tools.
* The Open source languages and frameworks for software development.

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 Open source systems.	K2
CO2	Apply the basic principles Open source software.	K3
CO3	Develop skill sets in Open source tools.	K3
CO4	Apply the concepts of Open source in solving problems.	K3
CO5	Build and modify free and open source software packages.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A4GA	GENERIC ELECTIVE: OPEN SOURCE TECHNOLOGY	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I   Introduction to Open Source   5 h

Introduction-Open Source -advantages of open source software's - Free Software-Free Software vs. Open Source software - Public Domain Software - FOSS does not mean no cost. History- Berkeley Software Distribution (BSD) - the Free Software Foundation and the GNU Project.

Unit II   Principles and Open Source Methodology   5 h

Open Source History- Principle and methodologies-Philosophy-Software Freedom-Open Source Development Model Licenses and Patents- License - Important FOSS Licenses - copyrights and copy lefts- Patents Economics of FOSS -Zero Marginal Cost- Income-generation opportunities- Problems with traditional commercial software-Internationalization.

Unit III   Community Building and Open Source Project   5 h

Community Building: Importance of Communities in Open Source Movement-JBoss Community - Open source projects: Starting and Maintaining an Open Source Project - Open Source Hardware- Open Source Design - Open source Teaching - Open source media.

Unit IV   Open Source Ethics   5 h

Introduction to Open source ethics - need for ethics - Open source vs. closed source - Open source government-Open source ethics - Social and Financial impacts of open source technology- Shared software-Shared source.

Unit V   Case Studies   4 h

Apache- BSD- Linux- Mozilla (Firefox)-Wikipedia- Joomla-GCC - Open Office- Perl-Ruby -Drupal -Moodle.

Text Books

1 Kailashvedera and BhavyeshGandhi, (2013), "Open Source Technology ",(2nd Edn.), University Science Press.

References

1 Paul Kavanagh, (2007), "Open Source Software: Implementation and Management", Elsevier Digital Press.

2 Fadi P Deek,JamesA.M.McHugh, (2008),"Open Source:Technology and Policy", (2nd Edn.), Cambridge University Press.

191TL1A4AA	பகுதி – 4 : அடிப்படைத்தமிழ் - தாள் : II (Basic Tamil)	SEMESTER IV

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019–20ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

(10 மற்றும் 12 – ஆம் வகுப்பு வரை தமிழ் மொழிப்பாடம் பயிலாதவர்களுக்கு)

(பருவத் தேர்வு உண்டு)

அலகு : 1   12 h

நீதி நூல்கள்

I. ஆத்திசூடி   - "அறம் செய விரும்பு" முதல் "ஒளவியம் பேசேல்"வரை -12 பாடல்கள்

II. கொன்றைவேந்தன் - "அன்னையும் பிதாவும் முன்னறி தெய்வம்" முதல்

"எண்ணும் எழுத்தும் கண் எனத் தகும்" வரை -7 பாடல்கள்

III. திருக்குறள் - 6 பாடல்கள்

1. அகர முதல ....……………..1

2. மனத்துக் கண்.........................34

3. இனிய உளவாக 100

4. தீயவை தீய பயத்தலான்……….202

5. கற்க கசடற 391

6. கண்ணொடு கண்ணினை..........1100

அலகு : 2   12 h

I. எளிய நீதிக்கதைகளும் வாழ்க்கை முறைகளும்

1. நீதிகாத்த மன்னன்

2. சிங்கமும் முயலும்

3. புத்திசாலி உழவனும் போக்கிரிப் பூதமும்

4. தேனீயும் புறாவும்

5. முயல் கூறிய தீர்ப்பு

II. தமிழகப் பண்பாடுகள்

1. தமிழர் விழாக்கள் - பொங்கல், ஆடிப்பெருக்கு

2. தமிழர் கலைகள் - தெருக்கூத்து, ஓவியம், சிற்பம்

3. தமிழர் விளையாட்டுகள்- ஏறுதழுவுதல், சடுகுடு

III . பயிற்சிப் பகுதி

1. படத்திற்கு ஏற்ற சொற்களை எழுதுதல்.
2. சொற்களைத் தொடராக்குதல்.
3. பொருத்துதல்,
4. உரையாடல் பகுதி

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - **100**

பகுதி – அ

சரியான விடையைத் தேர்வு செய்தல்   10x2=20

பகுதி – ஆ

சரியா? தவறா? தேர்ந்தெடுத்து எழுதுக .   10x2=20

பகுதி - இ

ஒரு பக்க அளவில் விடையளிக்க   03x20=60

குறிப்பு:

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

Text Books

1   அடிப்படைத்தமிழ் -   20-21. தொகுப்பு : தமிழ்த்துறை   , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி)லிட். சென்னை-600 098

References

1   ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம்

2   வலைதள முகவரி : http://tamilvu.org

| 191TL1A4AB | பகுதி – 4 : சிறப்புத்தமிழ் - தாள் : II
(Advanced Tamil) | SEMESTER - IV |

Total Credits: 2

Total Instruction Hours: 24 h

இளங்கலை 2019– 2020 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது

(10 மற்றும் 12 – ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது

(பருவத் தேர்வு உண்டு)

அலகு – 1   05 h

திருக்குறள்

I அறத்துப்பால்

    1. இனியவை கூறல்   - அதிகார எண் : 10

    2. அடக்கமுடைமை   - அதிகார எண் : 13

II பொருட்பால்

    1. கல்வி   - அதிகார எண் : 40

    2. உழவு   - அதிகார எண் : 104

III இன்பத்துப்பால்

    1. தகையணங்குறுத்தல்   - அதிகார எண் :109

    2. பிரிவாற்றாமை   - அதிகார எண் : 116

அலகு – 2   05 h

கட்டுரைத் தொகுப்பு

I நல்வாழ்வு - டாக்டர் மு.வரதராசன்

    1. நம்பிக்கை

    2. புலனடக்கம்

    3. பண்பாடு

II இளைஞர்களின் ஒளிமயமான எதிர்காலத்திற்கு - கு.வெ. பாலசுப்பிரமணியம்

    1. காலக்கணக்கு

    2. நற்பழக்கமே செல்வம்

அலகு – 3   05 h

I காப்பியங்கள் - குறிப்பு எழுதுதல்

    1. சிலப்பதிகாரம்

    2. மணிமேகலை

    3. கம்பராமாயணம்

    4. பெரியபுராணம்

II ஊடகம் - காட்சி ஊடகங்கள்

1. தொலைக்காட்சி
2. திரைப்படம்
3. இணையம்
4. முகநூல்
5. கீச்சகம்
6. கட்செவி அஞ்சல்

அலகு – 4   05 h

இலக்கணம் - வழக்கறிதல்

1. இயல்பு வழக்கு
2. தகுதி வழக்கு

அலகு – 5   04 h

I படைப்பாற்றல் பகுதி

கவிதை,கட்டுரை எழுதச்செய்தல் - பொதுத் தலைப்பு

II பயிற்சிப் பகுதி

தமிழில் தட்டச்சு செய்தல் - யூனிகோடு எழுத்துருவில்.

Note: பயிற்சிப் பகுதியில் வினாக்கள் அமைத்தல் கூடாது

வினாத்தாள் அமைப்பு முறை - மொத்த மதிப்பெண்கள் - 100

பகுதி –அ

சரியான விடையைத் தேர்வு செய்தல்   10x2=20

பகுதி –ஆ

கோடிட்ட இடங்களை நிரப்புக   10x2=20

பகுதி –இ

இரண்டு பக்க அளவில் விடையளிக்க   4x15=60

குறிப்பு :

- அனைத்து அலகுகளில் இருந்தும் இரண்டு வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ –க்கான வினாக்கள் இது   அல்லது அது   என்ற வகையில் அந்தந்த அலகுகளிலிருந்து அமைதல் வேண்டும்.

Text Books

1   *சிறப்புத்தமிழ் 20-21. தொகுப்பு : தமிழ்த் துறை , டாக்டர் என்.ஜி.பி. கலை அறிவியல் கல்லூரி, நியூ செஞ்சுரி புக் ஹவுஸ்(பி) லிட். 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   வலைதள முகவரி : http://tamilvu.org

192PY1A4AA	AECC : GENERAL AWARENESS	SEMESTER IV

Total Credits: 2
Total Instructions Hours: 24 h

S.No	Contents
1	Current Events
2	General Science
3	Geography of India
4	Tamil and Other Literature
5	Inventions and Discoveries
6	Numerical and Mental Aptitude
7	Verbal and Non Verbal Reasoning
8	Socio- Culture and Heritage of India
9	Indian Economy and Political System
10	History of India and Freedom Struggle

References

1 Majid Hussain, Arrora N D, 2019, "General Studies -TNPSC Group -I ", G.K.Publications (P) Ltd. New Delhi

2 Aggarwal R S, 2014, "Verbal and Non Verbal Reasoning" S Chand & Company, New Delhi

3 Competition Success Review, Competitive Success Publisher, New Delhi

4 Pratiyogita Darpan, Pratiyogita Darpan Publishers, Agra.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5CA	CORE – VIII : NATURAL LANGUAGE PROCESSING	CORE	4	1	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental concepts and techniques of Natural Language Processing
- Identify and apply the various NLP techniques to solve real-time problems.
- To apply the concept of data structures to various real-time applications.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts of NLP.	K1
CO2	Demonstrate the NLP models and algorithms.	K2
CO3	Differentiate the levels of analyzers for language processing.	K3
CO4	Apply the levels of analyzers for language processing.	K3
CO5	Determine the NLP algorithms for linguistic processing.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5CA	CORE : NATURAL LANGUAGE PROCESSING	**SEMESTER** V

Total Credits: 4

Total Instruction Hours: 60 h

Syllabus

Unit I   Introduction to NLP   12 h

Introduction - Application of NLP techniques and key issues - MT grammar checkers - Dictation – Document generation - NL interfaces - Natural language processing key issues - The different analysis level used for NLP: Morpho-lexical- syntactic - semantic-pragmatic-markup (TEI, UNICODE) - Finite state automata - Recursive and augmented transition networks - Open problems.

Unit II   Lexical Level   12 h

Lexical level: Error tolerant lexical processing (spelling error correction) - Transducers for the design of morphologic analyzers - Features - Towards syntax: part-of-speech tagging (BRILL, HMM) - Efficient representations for linguistic resources (lexica, grammars) tries and finite state automata.

Unit III   Syntactic Level   12 h

Syntactic level: Grammars (formal/Chomsky hierarchy - DCSGs - Systematic case - unification - Stochastic) - Parsing (Top-down - Bottom up - char (early algorithm) - CYK algorithm) - Automated estimation of probabilistic model parameters (Inside-outside algorithm) - Data oriented parsing grammar formalisms and tree banks - Efficient parsing for context-free grammars.

Unit IV   Semantic Level   12 h

Semantic level: Logical forms - Ambiguity resolution- Semantic network and parsers - Procedural semantics - Montague semantics - Vector space approaches - Distributional semantics - Lexical semantics - Word sense disambiguation - Compositional semantics semantic role labeling - Semantic parsing

Unit V   Pragmatic Level   12 h

Pragmatic level: Knowledge representation- Reasoning- Plan/goal recognition – speech acts/intentions – Belief models - Discourse - Reference. Natural language generation: Content determination – Sentence planning - Surface realization - Subjectivity & Sentiment analysis: IE – Automatic Summarization - IR - Question answering – Named entity recognition and relation extraction – IE using sequence labeling - Machine translation.

Text Books

1   Daniel J and James H. Martin, (2013), "Speech and language processing - An introduction to natural language processing, computational linguistics& speech recognition"(2nd Edn.), Prentice Hall.

References

1   Lan H Written and Elbef. MarkA.Hall, (2013),"Data mining: Practical Machine Learning Tools and Techniques", (3rd Edn.)Morgan Kaufmann.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5CB	CORE - IX: COMPUTER NETWORKS	CORE	4	0	0	3

PREAMBLE

This course has been designed for students to learn and understand

- The basics of computer networks.
- To identify the functionalities of different network layers.
- The functionality at each layer for given 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 networking.	K1
CO2	Differentiate wired and wireless networks.	K2
CO3	Elucidate the role of protocols in data link layer.	K2
CO4	Expose the functionalities of network layer.	K3
CO5	Illustrate the working principles of transport layer.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5CB	CORE : COMPUTER NETWORKS	SEMESTER V

Total Credits: 3

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction   10 h

Introduction – Network - Hardware – Software – Reference Models – OSI model - TCP/IP Models – Example Networks: Internetwork - ATM - Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media - Unguided transmission media.

Unit II   Wireless Transmission   10 h

Introduction to Wireless Transmission - Functions - Advantages of wireless communication - Communication Satellites – Telephone System: Structure - Local Loop - Trunks and Multiplexing and Switching. Data Link Layer: Duties of Data Link Layer - Design Issues – Error Detection and Correction.

Unit III   Data Link Layer Protocols   10 h

Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – An overview of IEEE Standard for LANs - MAC Address - Bluetooth.

Unit IV   Network Layer   9 h

Duties of Network Layer - Design Issues - Circuit Switching Vs Packet Switching - Packet Switched Networks - Types of Routing-routing algorithms - Congestion control algorithms - Network Protocols - IP- IPV4 - IPV6 - Subnets - Gateways- Congestion Avoidance in Network Layer.

Unit V   Transport Layer and Application layer   9 h

Transport Layer - Services - Connection Management - Addressing - Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security - Cryptography - Principles of Network Applications - Web and HTTP - Electronic mail - DNS.

Text Books

1   A. S. Tanenbaum, (2013), "Computer Networks", (5th Edn.), Prentice-Hall of India.

References

1   B. A. Forouzan,(2013), "Data Communications and Networking", (5th Edn.), TMH.

2   F. Halsall, (2008),"Data Communications, Computer Networks and Open Systems", (2nd Edn.),Pearson Education.

3   D. Bertsekas and R. Gallagher,(2008), "Data Networks",(2nd Edn.), PHI.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5CC	CORE – X : INTERNET OF THINGS AND ITS APPLICATIONS	CORE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The basics of IoT.

- The factors to the emergence of IoT.

- To design and program IoT devices for real-time applications.

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 Internet of Things.	K1
CO2	Analyze basic protocols in wireless sensor network.	K2
CO3	Identify the different types of IoT applications	K2
CO4	Implement IoT applications on embedded platform.	K3
CO5	Identify the domain specific IoT.	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5CC	CORE : INTERNET OF THINGS AND ITS APPLICATIONS	SEMESTER V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to IoT   10 h

Introduction – Definition and Characteristics of IoT - Physical Design of IoT -Things in IOT - Logical Design of IoT - IoT Functional Blocks - IoT Communication APIs - IoT Enabling Technologies - WSN-Cloud Computing - Big Data Analysis - Communication Protocols - Embedded Systems.

Unit II   IoT Hardware   10 h

IoT Hardware - Devices and Platforms – Basics of Arduino Hardware - The Arduino IDE - Basic Arduino Programming - Basics of Raspberry pi - Introduction to Raspberry pi - Programming with Raspberry pi - CDAC - IoT devices: Ubimote - Wi-Fi mote - BLE Mote - WINGZ gateway-Introduction to IoT Platforms - IoT Sensors and actuators.

Unit III   IoT Protocols   10 h

Introduction to IoT Protocols - IoT Protocols – IoT Data link Protocols - Network Layer Routing Protocols - Network Layer Encapsulation Protocols - Session Layer Protocols - IoT Security Protocols - Service Discovery Protocols and Infrastructure Protocols.

Unit IV   IoT Programming   9 h

IoT Programming – Arduino Programming-Serial Communications – Getting Input from Sensors - Visual-Physical and Audio Outputs - Remotely Controlling External Devices - Wireless Communication - Programming with Raspberry pi: Basics of Python programming - Python Packages of IoT - IoT Programming with CADC IoT devices.

Unit V   Domain Specific IoT   9 h

Domain Specific IoT – Home automation-smart cities - Smart Environment - IoT in Energy - Logistics - Agriculture - industry and Health & Life style sensors - Case Studies: A Case Study of Internet of Things using Wireless Sensor Networks and Smart Phones - Security Analysis of Internet-of-Things:A Case Study of August Smart Lock - Open IoT Platform.

Text Books

1   Vijay Madisetti and ArshdeepBahga, (2014),"Internet of Things (A Hands-on-Approach)", (1st Edn.), VPT.

References

1   Monk Simon,(2016),"Raspberry Pi Cookbook: Software and hardware problems and Solutions", O'Reilly Media, Inc.

2   Margolis Michael, (2011), "Arduino CooK book: Receipes to begin, Expand and Enhance Your Projects", O'Reilly Media Inc.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5CD	CORE – XI : CYBER SECURITY	CORE	3	0	0	3

PREAMBLE

This course has been designed for students to learn and understand

- The need for cyber security and its related threats and attacks.

- The methods for secure communication in the cyber world.

- The best practices and regulations related to cyber security.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of cybercrime.	K1
CO2	Describe the Cyber Crime Strategy.	K2
CO3	Identify the Cyber Crime Investigation Methodology.	K3
CO4	Generalize the knowledge on Digital Forensics.	K3
CO5	Apply the Cyber Crime and Digital Forensics concepts in real-time scenarios.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5CD	**CORE** : CYBER SECURITY	**SEMESTER** V

Total Credits: 3

Total Instruction Hours: 36 h

Syllabus

Unit I   Basics of Cyber crime   8 h

Introduction - Cyber Threat – Definition of Cyber Crime – Classification – Current Threats and Trends – Diversity of Cyber Crime – Cyber Hate Crimes – Cyber Terrorism - Need for cyber security.

Unit II   Responding to Cyber crime   7 h

Cyber Strategy – National Security Strategy – Cyber Security Strategy – Organized Crime Strategy – Cyber Crime Strategy - Policy Cyber Crime – International Response – National Cyber Security Structure – Strategic Policy Requirements – Police and Crime Commissioners.

Unit III   Investigating Cyber crime   7 h

Preventing Cyber Crime – Password Protection – Get Safe Online – Cyber Security Guidance for Business - Cyber Crime Investigation Skills – Criminal Investigation – Code of Ethics – Evidence – Hi-Tech Investigations – Capturing and Analyzing Digital Evidence.

Unit IV   Foundations of Digital Forensics   7 h

Introduction to Digital Forensics - Forensic Software and Hardware - Analysis and Advanced Tools - Forensic Technology and Practices - Forensic Ballistics and Photography - Face-Iris and Fingerprint Recognition - Audio Video Analysis - Windows System Forensics - Linux System Forensics - Network Forensics.

Unit V   Case Studies   7 h

Latest Study Topics on Cyber Crime and Investigations - Recent Cyber Crime Cases – Recent Digital Forensics Cases – Bridging the Gaps in Cyber Crime Investigations between the Cyber security stake holders.

Text Books

1   Thomas Halt, Adam M. Bossler and Kathryn C. Seigfried Spellar, (2017), "Cybercrime and Digital Forensics: An Introduction", Routledge Taylor and Francis Group.

References

1   Bernadette H Schell, Clemens Martin, (2004), "Cybercrime", ABC – ClioInc, California.

214AI1A5CP	**CORE PRACTICAL:** NLP USING PYTHON	**SEMESTER- V**

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Implement word similarity
2	Implement simple problems related to word disambiguation
3	Demonstration of Part of Speech Tagging.
4	Design a Lexical Analyzer.
5	Design a Semantic Analyzer.
6	Develop the Sentiment Analysis.
7	Implement noise removal in text processing.
8	Implement entity extraction algorithm.
9	To implement the Chatbot API.
10	To implement the Cloud NLP API
11	Build Speech to text API model
12	Perform Email spam filtering using Python.

Note: Out of 12 - 10 Mandatory

214AI1A5CQ	**CORE PRACTICAL:** COMPUTERNETWORKS	**SEMESTER- V**

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Perform the basic network commands.
2	Create a Socket program
3	Implement Client-Server application for chat using TCP.
4	Perform File Transfer in Client-Server Using TCP/IP.
5	Implement Remote Command Execution.
6	To implement client-server application using UDP.
7	Implement Address Resolution Protocol.
8	Write a java program to download a web page
9	Create a Socket program for implementation of TCP module
10	Implement Remote Method Invocation
11	Implement File Transfer Protocol.
12	Implement Bit Stuffing.

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5DA	ELECTIVE : TEXT AND WEB MINING	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The numerous methods of text extraction process.
- To differentiate clustering and classification techniques on text.
- The basics of web content mining.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the various text extraction techniques.	K1
CO2	Understand the clustering techniques.	K1
CO3	Apply the classification techniques among textual document.	K2
CO4	Implement the various web mining algorithms.	K3
CO5	Develop a web recommendation systems for social networking.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5DA	ELECTIVE : TEXT AND WEB MINING	**SEMESTER** V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Text Extraction   10 h

Text Extraction: Introduction - Rapid automatic keyword extraction - Candidate keywords - Keyword scores - Adjoining keywords - Extracted keywords - Benchmark evaluation - Precision and recall - Efficiency - Stop-list generation- Evaluation on new articles.

Unit II   Clustering   10 h

Introduction to Clustering: Multilingual document clustering - Multilingual LSA - Tucker1 method - PARAFAC2 method - LSA with term alignments - LMSA - LMSA with term alignments.

Unit III   Classification   10 h

Introduction to Classification: Content-based spam email classification using machine-learning algorithms-Utilizing non-negative matrix factorization for email classification problems-Constrained clustering with k-means type algorithms.

Unit IV   Information retrieval and Web Mining   9 h

Introduction to Information retrieval - Basic Concepts of Information Retrieval - Information Retrieval Methods – Text and Web Page Preprocessing - Web crawling - Text indexing- scoring and ranking - Information extraction and integration - Web Mining Algorithms - Online opinion mining sentiment analysis - Review spam detection.

Unit V   Social Network Analysis   9 h

Link analysis - Social network mining algorithms - Online social media analysis and modelling - Co-Citation and Bibliographic Coupling - Page Rank Algorithm - HITS Algorithm - Community Discovery - Problem Definition - Bipartite Core Communities - Maximum Flow Communities - Email Communities - Web Recommendation System.

Text Books

1 Michael W. Berry & Jacob Kogan, (2011)"Text Mining Applications and Theory", (1st Edn.) Wiley publications.

2 Prabhakar Raghavan, HinrichSchtze, Christopher D. Manning (2008), "Introduction to Information Retrieval", (2nd Edn.),Cambridge University Press,

References

1 Aggarwal, Charu C., and ChengXiangZhai, (2012),"Mining text data", (1st Edn.), Springer Science & Business Media.

2 Srivastava, Ashok N., and Mehran Sahami, (2009),"Text mining: classification, clustering, and applications." (2nd Edn.)Chapman and Hall/CRC.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5DB	ELECTIVE : SOFTWARE ENGINEERING	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The basic principles and paradigms of software engineering.

- The Software Requirement Specification (SRS) for a project.

- The reliability, quality and management control for a software project.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the various software process models.	K1
CO2	Identify functional and non-functional requirements.	K2
CO3	Develop preliminary and detailed models for the system.	K3
CO4	Validate the design using various testing techniques.	K3
CO5	Apply the software quality management standards.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5DB	ELECTIVE: SOFTWARE ENGINEERING	**SEMESTER** V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Introduction - Software Engineering Discipline - Evolution and Impact - Programs Vs Software Products. Software Life Cycle Models: Use of a Life Cycle Models - Classical Waterfall Model - Iterative Waterfall Model - Prototyping Model - Evolutionary Model - Spiral Model..

Unit II Requirements Analysis and Specification 10 h

Requirements Gathering and Analysis - Software Requirements Specification (SRS) - Formal System Development Techniques. Software Design: Characteristics of a Good Software Design - Cohesion and Coupling - Neat Arrangement - Software Design Approaches.

Unit III Function-Oriented Software Design 10 h

Overview of SA/SD Methodology - Structured Analysis - Data Flow Diagrams (DFDs) - Object Modeling Using UML: Overview of Object-Oriented Concepts - UML Diagrams - Use Case Model - Class Diagrams - Interaction Diagrams - Activity Diagrams - State Chart Diagram.

Unit IV User Interface Design 9 h

Characteristics of a Good User Interface - Basic Concepts - Types of User Interfaces - Component-Based GUI Development; Coding and Testing: Coding - Testing - UNIT Testing - Black-Box Testing - White-Box Testing - Debugging - Integration Testing - System Testing.

Unit V Software Reliability and Quality Management 9 h

Software Reliability - Statistical Testing - Software Quality - Software Quality Management System - ISO 9000 - Computer Aided Software Engineering: CASE Environment - CASE support in Software Life Cycle - Characteristics of CASE Tools - Architecture of a CASE Environment. Software Maintenance - Software Reuse.

Text Books

1 Roger Pressman and Bruce Maxim,(2019)," Software Engineering: A Practitioner's Approach",(8th Edn.), McGraw-Hill Education.

References

1 Rajib Mall, (2014),"Fundamentals of Software Engineering", (4th Edn.), Prentice Hall of India Private Limited.

2 Richard Fairley, (2004),"Software Engineering Concepts", TMGH Publications.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A5DC	ELECTIVE : COGNITIVE ANALYTICS	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- To simulate human thinking in a systematic model.

- The design principles for Cognitive Systems

- Apply advanced analytics to do Cognitive computing.

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 Cognitive computing.	K1
CO2	Apply the design principles for building the efficient Cognitive model.	K2
CO3	Correlate the Big Data and Cognitive Computing.	K3
CO4	Analyze to represent the knowledge in taxonomies and ontologies.	K3
CO5	Applying advanced analytics to do Cognitive computing.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A5DC	ELECTIVE: COGNITIVE ANALYTICS	**SEMESTER** V

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Basics of Cognitive Computing   10 h

Cognitive Computing as a New Generation - Uses of Cognitive Systems - Gaining Insights from Data - Artificial Intelligence as the Foundation of Cognitive Computing - Understanding Cognition -Two Systems of Judgment and Choice - Understanding Complex Relationships between Systems -The Elements of a Cognitive System.

Unit II   Design principles   10 h

Components of a Cognitive System - Building the Corpus - Bringing Data into the Cognitive System - Machine Learning - Hypotheses Generation and Scoring - Presentation and Visualization Services.

Unit III   Big Data & Cognitive Computing   10 h

Dealing with Human - Generated Data - Defining Big Data -The Architectural Foundation for Big Data - Analytical Data Warehouses - Hadoop - Data in Motion and Streaming Data - Integration of Big Data with Traditional Data.

Unit IV   Knowledge representation   9 h

Representing knowledge - Defining Taxonomies and Ontologies - Explaining knowledge representation - Models for knowledge representation - Implementation considerations.

Unit V   Advanced Analytics   9 h

Advanced Analytics is on a Path to Cognitive Computing -Key Capabilities in Advanced Analytics -Using Advanced Analytics to Create Value -Impact of Open Source Tools on Advanced Analytics.

Text Books

1   Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles,(2015),"Cognitive Computing and Big Data Analytics",(2nd Edn.), Wiley.

References

1   Mark Watson, (2017)" Introduction to Cognitive Computing",(1st Edn.), LeanPub .

.

Course Code	Course Name	Category	L	T	P	Credit
192MT1A5AA	AECC - V: RESEARCH METHODOLOGY	AECC	2	0	0	2

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental concepts of Research Methodology.
- The various types of data collection methods for solving research problems.
- Emphasis on writing research articles.

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 research problem and design.	K1
CO2	Understand the measurement and scaling techniques.	K2
CO3	Apply the different data collection methods.	K2
CO4	Analyze the data processing and analysis techniques.	K3
CO5	Develop research article writing skills.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	S	S	M	L	M
CO4	M	S	M	M	M
CO5	M	S	M	M	M

S   Strong   M   Medium   L   Low

192MT1A5AA	AECC - V: RESEARCH METHODOLOGY	**SEMESTER** V

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I   Introduction of Research   5 h

Meaning - Objectives - Motivation - Types - Research Approaches - Significance of Research - Research Methods Vs Methodology - Research and Scientific Method - Importance of Knowing How Research is Done - Research Process - Criteria of Good Research.

Unit II   Research Problem and Research Design   5 h

Defining the Research Problem: Definition - Selecting the Problem - Necessity of Defining the Problem - Technique Involved in Defining a Problem-Research Design: Meaning - Need for Research Design - Features of Good Design - Important Concepts Relating to Research Design - Different Research Designs - Basic Principles of Experimental Designs.

Unit III   Sampling Design   5 h

Sampling Design: Census and Sample Survey - Implications of a Sample Design - Steps in Sampling Design - Criteria of Selecting a Sampling Procedure - Characteristics of a Good Sample Design - Different Types of Sample Designs-Measurement and Scaling

Unit IV   Data Collection   5 h

Methods of Data Collection: Collection of Primary Data - Observation Method - Interview Method - Collection of Data through Questionnaires - Collection of Data through Schedules - Difference between Questionnaires and Schedules - Some Other Methods of Data Collection - Collection of Secondary Data - Selection of Appropriate Method for Data Collection.

Unit V   Data Processing and Analysis   4 h

Processing and Analysis of Data: Processing Operations - Some Problems in Processing - Elements/Types of Analysis - Statistics in Research - Measures of Central Tendency - Measures of Dispersion - Measures of Asymmetry (Skewness) - Measures of Relationship.

Text Books

1   Kothari C.R., Gaurav Garg, (2019), "Research Methodology Methods and Techniques", (4th Edn.), New Age International Publishers.

References

1   Dr.Shanthi Bhusan Mishra, Dr.ShashiAlok, (2019), "Handbook of Research Methodology", (1st Edn.), Edu creation Publishing.

2   Dr.Prabhat Pandey, Dr.Meenu Mishra Pandey, (2015), "Research Methodology: Tools and Techniques", (1st Edn.), Bridge Center. ll.

3   Ranjit Kumar, (2014), "Research Methodology - A Step by Step Guide for Beginners", (3rd Edn.), Sage Publications.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6CA	**CORE - XII** : NEURAL NETWORK AND DEEP LEARNING	CORE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental techniques and principles of Neural Networks

- The different models in ANN and its applications.

- The concepts of Deep learning & CNN.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand basics of Neural Networks.	K1
CO2	Realize the feed forward networks techniques and its challenges.	K2
CO3	Distinguish the different types of ANN architectures.	K2
CO4	Apply Deep learning concepts using Back Propagation strategy	K3
CO5	Apply the CNN models for object detection	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6CA	**CORE** : NEURAL NETWORK AND DEEPLEARNING	**SEMESTER** VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to ANN   10 h

Fundamentals of Neural Networks –Types of Neural Networks - Model of Artificial Neuron – Neural Network Architectures – Learning Methods – Taxonomy of Neural Network Architectures – Applications of Neural Network.

Unit II   Feed Forward Neural Networks   10 h

Perceptron Models: Discrete - Continuous and Multi-Category – Training Algorithms: Discrete and Continuous Perceptron Networks – Limitations of the Perceptron – Model. Credit Assignment Problem – Generalized Delta Rule-Derivation of Back propagation (BP) Training and Summary of Back propagation Algorithm – Kolmogorov Theorem

Unit III   Other ANN Architectures   10 h

Associative Memory – Exponential BAM – Associative Memory For Real Coded Pattern Pairs – Applications Adaptive Resonance Theory – Introduction – ART 1 – ART2 – Applications – Neural Networks Based On Competition – Kohenen Self Organizing Maps – Learning Vector Quantization – Counter Propagation Networks – Industrial Applications.

Unit IV   Deep Learning   9 h

Introduction to Deep learning - Deep Feed Forward network - Regularizations - Training deep models - Dropouts - Training Deep Neural Networks using Back Propagation - Setup and initialization issues - Vanishing and exploding Gradient problems - Gradient - Descent Strategies.

Unit V   CNN and DL Tools   9 h

Introduction to Convolutional Neural Network - Basic structure of Convolutional Network- Case studies: Alex net - VGG-Net - GoogLeNet - Applications of CNN – Object Detection - Content based image Retrieval - Deep Learning Tools: Caffe-Theano - Torch

Text Books

1. CharuC.Aggarwal (2018), "Neural Networks and Deep learning" (1st Edn.),Springer International Publishing.

2. Satish Kumar, (2007), "Neural Networks, A Classroom Approach",(1st Edn.),TMH.

References

1   Michael Nielsen, (2015), "Neural Networks and Deep Learning", (1st Edn.), Determination Press.

2   Bishop, Christopher M.(2006)," Pattern Recognition and Machine Learning", Springer

3   Duda, Richard, (2000)," Peter Hart, and David Stork. Pattern Classification", (2nd Edn.), New York, NY: Wiley.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6CB	CORE - XIII: CLOUD COMPUTING	CORE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The concept and evolution of Cloud Computing.

- The knowledge on the various issues in Cloud Computing.

- The emergence of Cloud Computing paradigm.

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 Cloud Computing.	K1
CO2	Identify the enabling technologies for the development of Cloud.	K2
CO3	Apply the various cloud service models for real-time applications.	K3
CO4	Emphasis on issues & challenges of Cloud Computing.	K3
CO5	Install and utilize the Cloud technologies.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6CB	CORE : CLOUD COMPUTING	**SEMESTER** VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction to Cloud Computing 10 h

Introduction: Definition of Cloud – Evolution of Cloud Computing – Types of cloud - Public cloud - Private cloud - Community cloud - Hybrid cloud - Underlying principles of Parallel & Distributed Computing – Cloud characteristics – Elasticity in Cloud – On-demand provisioning.

Unit II Cloud Enabling Technologies 10 h

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish - Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

Unit III Cloud Architecture, Services and Storage 10 h

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public-Private & Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

Unit IV Resource Management and Security in Cloud 9 h

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global exchange of Cloud Resources – Security Overview – Cloud Security challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

Unit V Cloud Technologies and Advancements 9 h

Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine –– Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation - Case studies on Cloud.

Text Books

1 Rittinghouse, John W., and James F. Ransome, (2017), "Cloud Computing: Implementation, Management and Security",(2nd Edn.), CRC Press.

2 Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, (2012), "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things",(1st Edn.),Morgan Kaufmann Publishers.

References

1 Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, (2013),"Mastering Cloud Computing", (1st Edn.),TMH.

2 Toby Velte, Anthony Velte, Robert Elsenpeter,(2009),"Cloud Computing – A Practical Approach, (1st Edn.),TMH.

214AI1A6CP	**CORE PRACTICAL:** NEURAL NETWORKS AND DEEP LEARNING IN PYTHON	SEMESTER- VI

Total Credits: 2
Total Instructions Hours: 48h

S.No	List of Experiments
1	Program to implement Perceptron.
2	To implement AND, OR gates using Perceptron.
3	Implement Crab Classification using pattern net.
4	Program to implement classification using Back propagation.
5	To implement classification of linearly separable data with a Perceptron
6	Program to analyze Long Short Term Memory for Time Series Prediction.
7	Build Convolutional Neural Network and Recurrent Neural Network.
8	Demonstrate input to pipeline using Tensor flow.
9	Build higher dimensional structures and operations in Tensor flow.
10	Create a computational graph using Tensor flow.
11	Program to analyze the Long-Short Term Memory / Gated Recurrent Units to predict the stock prices based on historic data
12	Build ImageNet, GoogleNet, ResNet CNNs

Note: Out of 12 - 10 Mandatory

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6DA	ELECTIVE : AUGUMENTED REALITY AND VIRTUAL REALITY	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- Creating an interactive virtual environment.
- The various interactive techniques involved in VR and AR.
- The applications of VR / AR in Digital platform

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic VR & AR concepts.	K1
CO2	Analyze the various interactive techniques.	K2
CO3	Build the systematic environments for data exploration.	K3
CO4	Implement the various VR & AR methods.	K3
CO5	Design and develop interactive VR and AR applications.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6DA	ELECTIVE : AUGUMENTED REALITY AND VIRTUAL REALITY	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to Virtual Reality   10 h

Introduction - Fundamental concept and components of Virtual Reality - Primary features - Present development on Virtual Reality - Computer graphics - Real time computer graphics - Flight simulation - Virtual environment requirement - Benefits of virtual reality - Historical development of VR.

Unit II   Scientific Landmark 3D Computer Graphics   10 h

Introduction - The Virtual world space - Positioning the virtual observer - The perspective projection - Human vision - Stereo perspective projection - 3D clipping - Colour theory - Simple 3D modelling - Illumination models - Reflection models - Shading algorithms - Radiosity - Hidden Surface Removal - Realism - Stereographic image.

Unit III   Interactive Techniques in Virtual Reality   10 h

Introduction - From 2D to 3D-3D space curves - 3D boundary representation - Geometrical Transformations: Introduction - Frames of reference - Modelling transformations - Instances - Picking - Flying - Scaling the VE - Collision detection - Generic VR system: Introduction - Virtual environment - Computer environment - VR technology - Model of interaction - VR Systems.

Unit IV   Augmented and Mixed Reality   9 h

Taxonomy - Technology and features of augmented reality - Difference between AR and VR - Challenges with AR - AR systems and functionality - Augmented reality methods - Visualization techniques for augmented reality - Wireless displays in educational augmented reality applications - Mobile projectioninterfaces - marker-less tracking for augmented reality - Enhancing interactivity in AR environments - Evaluating AR systems.

Unit V   Application of VR / AR in Digital Entertainment   9 h

VR Technology in Film & TV Production - VR Technology in Physical Exercises and Games - Demonstration of Digital Entertainment by VR - AR in Aircraft simulation - Vehicle modelling .

Text Books

1. Burdea, G. C. and P. Coffet., (2011),"Virtual Reality Technology", (3rd Edn.) Wiley-IEEE Press.

2. Alan B. Craig, (2013),"Understanding Augmented Reality, Concepts and Applications", (2nd Edn.), Morgan Kaufmann.

References

1. Anand R., (2010), "Augmented and Virtual Reality", (1st Edn.) Khanna Publishing House, Delhi

2. William R. Sherman, Alan B. Craig, (2008), "Understanding Virtual Reality: Interface, Application and Design", (1st Edn.), Morgan Kaufmann.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6DB	ELECTIVE : HUMAN COMPUTER INTERACTION	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The user's need of the interaction system.

- The various interaction design techniques and models.

- The cognitive aspects of human – machine interaction.

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 for HCI.	K1
CO2	Analyze the user's needs and methods in interaction system.	K2
CO3	Emphasis on elements, goals and universal design process.	K2
CO4	Evaluate the usability and effectiveness of various models.	K3
CO5	Apply the interaction techniques to build efficient systems.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6DB	ELECTIVE : HUMAN COMPUTER INTERACTION	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I Introduction 10 h

Foundation – Human – Computer – Interaction – Paradigms – Definition of HCI – Components – Cognitive Framework – Perception and Representation – Attention and Memory Constraint – Knowledge and Mental Model – Interface Metaphors – Input – Output.

Unit II Design Process 10 h

Interaction Styles – Interaction Design Basics – HCI in the Software Process – Design Rules - Designing Windowing Systems - User Support and On-Line Information - Designing For Collaborative Work and Virtual Environments - Principles and User - Centered Design - Methods for User-Centered Design.

Unit III Implementation and Evaluation Process 10 h

Introduction - Elements of windowing system - programming the application Implementation issues – Implementation Support - Goals of Evaluations - Evaluation techniques – Evaluation through experts - Evaluation through user participation - Universal Design – User Support.

Unit IV Models 10 h

Cognitive models – Linguistic models - Physical and device models - Cognitive architectures - Communication & collaboration models: Face to Face communication - Text based communication - Models of the system – Modeling Rich Interaction.

Unit V Applications 8 h

Socio – Organization issues and stakeholder requirements - Ubiquitous Computing - Context – Aware User Interfaces - Hypertext - Multimedia - World Wide Web- Virtual reality- Augmented reality - Decision support systems.

Text Books

1   Dix, Finlay, Abowd and Beale. (2004), "Human – Computer Interaction", (3rd Edn.), Prentice Hall.

2   J. Preece, Y. Rogers, H. Sharp, D. Benyon, S. Holland and T. Carey. (2000), "Human – Computer Interaction", (1st Edn.), Addison Wesley.

References

1   Frank Adelstein, Sandeep KS Gupta, Golden Richard,(2005)," Fundamentals of Mobile and Pervasive Computing", TMH.

2   Debashis Saha, (2002),"Networking Infrastructure for Pervasive Computing: Enabling Technologies",(1st Edn.), Kluwer Academic Publisher, Springer.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6DC	ELECTIVE : MOBILE AND PERVASIVE COMPUTING	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The characteristics and principles of mobile and pervasive computing.

- To design and implement mobile and pervasive applications.

- Outline to the enabling technologies of pervasive computing.

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 Mobile networks.	K1
CO2	Realize the principles of Wireless networks.	K2
CO3	Emphasis the various routing protocols in wireless networks.	K3
CO4	Analyze the importance of transport & application layers.	K3
CO5	Identify the enabling technologies of pervasive computing.	K2

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6DC	ELECTIVE : MOBILE AND PERVASIVE COMPUTING	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Mobile Networks   10 h

Introduction to Wireless transmission - Frequencies for radio transmission - Antennas - Cellular Wireless Networks – GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS.

Unit II   Wireless Networks   10 h

Infrared - UHF narrowband - Spread spectrum - Infrastructure and ad-hoc network - IEEE802.11: System architecture - Protocol architecture - Physical layer - MAC layer - 802.11b - 802.11a – Hyper LAN: WATM - BRAN - Hyper LAN2.

Unit III   Mobile Network Layer   10 h

Introduction to Mobile IP: Goals - Assumptions and requirement - IP packet delivery - Agent discovery - Tunneling and encapsulation - IPV6-Network layer in the internet - Mobile IP session initiation protocol - IP micro-mobility support - Dynamic host configuration protocol - Mobile Ad-hoc networks

Unit IV   Transport & Application Layers   9 h

TCP enhancements for wireless protocols – Traditional TCP: Congestion control - fast re-transmit/fast recovery - Implications of mobility – Classical TCP improvements: Indirect TCP - Snooping TCP - Mobile TCP - Time out freezing - Selective retransmission - Transaction oriented TCP – TCP over 3G Wireless networks.

Unit V   Pervasive computing   9 h

Pervasive computing infrastructure - Applications - Device Technology - Hardware - Human-machine Interfaces - Biometrics and Operating systems – Device Connectivity – Protocols - Security and Device Management - Pervasive Web Application architecture - Access from PCs and PDAs - Access via WAP.

Text Books

1 Jochen Burkhardt,(2007),"Pervasive Computing: Technology and Architecture of Mobile Internet Applications",(3rd Edn), Addison-Wesley Professional.

2 Jochen Schiller, (2003), "Mobile Communications", (2nd Edn.),PHI.

References

1 Frank Adelstein, Sandeep KS Gupta, Golden Richard,(2005)," Fundamentals of Mobile and Pervasive Computing", TMH.

2 Debashis Saha, (2002),"Networking Infrastructure for Pervasive Computing: Enabling Technologies",(1st Edn.), Kluwer Academic Publisher, Springer.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6DD	ELECTIVE : PATTERN AND ANOMALY DETECTION	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

* The various pattern recognition principles.

* To develop algorithms for pattern recognition.

* The different anomaly detection techniques and approaches.

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 pattern recognition.	K2
CO2	Design systems and algorithms for pattern recognition	K2
CO3	Apply the appropriate algorithm after analyzing PR problem.	K3
CO4	Understand the fundamentals and techniques of anomaly detection.	K2
CO5	Apply the machine learning-based approaches for anomaly detection.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6DD	ELECTIVE : PATTERN AND ANOMALY DETECTION	**SEMESTER** VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction   10 h

Introduction: Definition of Pattern Recognition- Applications- Datasets for Pattern Recognition -Different paradigms for Pattern Recognition- Introduction to probability-events- random variables-Joint distributions and densities-moments- Estimation minimum risk estimators- problems.

Unit II   Representation   10 h

Representation: Data structures for Pattern Recognition- Representation of clusters- proximity measures- size of patterns-Abstraction of Data set- Feature extraction, Feature selection-Evaluation.

Unit III   Nearest Neighbor based classifiers & Bayes classifier   10 h

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm- variants of NN algorithms- use of NN for transaction databases- efficient algorithms- Data reduction-prototype selection- Bayes theorem- minimum error rate classifier- estimation of probabilities- estimation of probabilities and comparison with NNC- Naive Bayes classifier and Bayesians belief network.

Unit IV   Introduction to Anomaly Detection   9 h

Introduction- definition- types of anomalies - Point anomalies - Contextual anomalies - Collective anomalies - need for anomalies - Novelty Detection -Anomaly Detection Techniques- Simple Statistical Methods.

Unit V   Machine Learning-Based Approaches   9 h

Density-Based Anomaly Detection- Clustering-Based Anomaly Detection - Support Vector Machine-Based Anomaly Detection- Building a Simple Detection Solution Using a Low-Pass Filter.

Text Books

1   V Susheela Devi, M Narsimha Murthy, (2011),"Pattern Recognition-An Introduction", (2nd Edn.), Universities Press.

2   V Chandola, A Banerjee and V Kumar, (2009),"Anomaly Detection: A Survey", (1st Edn.), ACM Computing Surveys.

References

1   Duda R. O., P.E. Hart, D.G. Stork,(2000)," Pattern Classification ", (1st Edn.), John Wiley.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6DE	ELECTIVE : COMPUTATIONAL INTELLIGENCE	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

* To provide a strong foundation on fundamental concepts in CI.

* To enable problem-solving through various intelligent techniques.

* To apply Computational strategy for IR process.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the goals and methods of CI.	K1
CO2	Identify the design of intelligent computational techniques.	K2
CO3	Create and apply CI techniques in applications.	K3
CO4	Emphasis CI techniques for information retrieval mechanism.	K3
CO5	Apply the CI techniques for complex problem solving.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6DE	ELECTIVE : COMPUTATIONAL INTELLIGENCE	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I   Introduction to CI   10 h

Artificial Intelligence – A brief review – Pitfalls of traditional AI – Need for Computational Intelligence – Computational intelligence concept - Importance of tolerance of imprecision and uncertainty - Constituent techniques – Overview of Artificial Neural Networks - Fuzzy Logic - Evolutionary Computation.

Unit II   Knowledge Representation and Reasoning   10 h

Proposition Logic – First Order Predicate Logic – Unification – Forward Chaining - Backward Chaining - Resolution – Knowledge Representation – Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information – Prolog Programming.

Unit III   Neural Network   10 h

Neural Network: Biological and artificial neuron - Neural networks - Supervised and unsupervised learning - Single layer Perceptron - Multilayer Perceptron – Back propagation learning - Neural networks as associative memories - Hopfield networks - Bidirectional Associative Memory - Topologically organized neural networks – Competitive learning - Kohonen maps.

Unit IV   Fuzzy Logic   9 h

Fuzzy Logic: Fuzzy sets - Properties - Membership functions - Fuzzy operations. Fuzzy logic and fuzzy inference and applications - Evolutionary Computation - Constituent algorithms - Swarm intelligence algorithms - Overview of other bio-inspired algorithms - Hybrid approaches.

Unit V   Intelligence and Applications   9 h

Natural language processing - Morphological Analysis - Syntax analysis - Semantic Analysis - AI applications – Language Models – Information Retrieval – Information Extraction – Machine Translation – Machine Learning – Symbol-Based – Machine Learning: Connectionist – Machine Learning.

Text Books

1   Kumar S., (2017), "Neural Networks - A Classroom Approach", (2nd Edn.),TMH.

2   Konar A., (2011), "Computational Intelligence: Principles, Techniques and Applications", (2nd Edn.), Springer Verlag.

References

1   Stuart Russell, Peter Norvig, (2010)," Artificial Intelligence: A Modern Approach", Third Edition, Pearson Education / Prentice Hall of India.

2   Elaine Rich and Kevin Knight, (2010), "Artificial Intelligence, (3rd Edn.), TMH.

Course Code	Course Name	Category	L	T	P	Credit
214AI1A6DF	ELECTIVE : WIRELESS NETWORKS	ELECTIVE	4	0	0	4

PREAMBLE

This course has been designed for students to learn and understand

- The overview of Wireless networks area and its applications.

- The devices, schemes, concepts, and algorithms in Wireless communication.

- The evolution of 4G Networks, its architecture and applications.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand fundamentals of Wireless communications.	K1
CO2	Emphasis knowledge on Bluetooth technology.	K2
CO3	Outline the functions of mobile network layer.	K3
CO4	Build the skills required for Cellular Networks Design.	K3
CO5	Apply TCP/IP model for Mobile & Wireless networking.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	L	S	L	S	S
CO3	M	M	M	M	M
CO4	M	S	M	S	S
CO5	L	S	S	S	M

S   Strong   M   Medium   L   Low

214AI1A6DF	ELECTIVE : WIRELESS NETWORKS	SEMESTER VI

Total Credits: 4

Total Instruction Hours: 48 h

Syllabus

Unit I　　　Wireless LAN　　　　　　　　　　　　　　　　　10 h

Introduction - WLAN technologies: Infrared - UHF narrowband - Spread spectrum - Infrastructure & ad-hoc network - IEEE802.11: System architecture - Protocol architecture - Physical layer - MAC layer - 802.11b - 802.11a – Hyper LAN: WATM - BRAN - Hyper LAN2

Unit II　　　Bluetooth　　　　　　　　　　　　　　　　　　10 h

Introduction to Bluetooth: Architecture - Radio Layer - Baseband layer - Link manager Protocol - Security – IEEE802.16-SDP - Profiles - IEEE 802.15 - WIMAX: Physical layer- MA-Spectrum allocation for WIMAX

Unit III　　　Mobile network Layer　　　　　　　　　　　　10 h

Introduction – Mobile IP: Goals - Assumptions and requirement - IP packet delivery - Agent discovery - Tunneling and encapsulation - IPV6-Network layer in the internet - Mobile IP session initiation protocol - IP micro-mobility support - Dynamic host configuration protocol

Unit IV　　　Mobile ad-hoc Network　　　　　　　　　　　　9 h

Mobile ad-hoc network: Introduction to Routing - Advantages of routing - Types of routing - Routing tables - Link state routing - Distance vector routing - Destination Sequence distance vector - Dynamic source routing.

Unit V　　　Mobile Transport Layer　　　　　　　　　　　　9 h

TCP enhancements for wireless protocols – Traditional TCP: Congestion control - Fast retransmit/fast recovery - Implications of mobility – Classical TCP improvements: Indirect TCP - Snooping TCP - Mobile TCP - Time out freezing - Selective retransmission - Transaction oriented TCP – TCP over 3G Wireless networks.

Text Books

1 Jochen Schiller, (2012),"Mobile Communications", (2nd Edn.), Pearson Education 2012.

2 Vijay Garg, (2007), "Wireless Communications and networking", (1st Edn.), Elsevier.

References

1 Simon Haykin, Michael Moher, David Koilpillai,(2013),"Modern Wireless Communications", (1st Edn.), Pearson Education.

2 Anurag Kumar, D.Manjunath, Joy kuri, (2011), "Wireless Networking", (1st Edn.), Elsevier.

Course Code	Course Name	Category	L	T	P	Credit
193BC1A6AA	AECC - VI: INNOVATION,IPR & ENTREPRENEURSHIP	AECC	2	0	0	2

PREAMBLE

This course has been designed for students to learn and understand

- The fundamental aspects of Intellectual property rights.
- The knowledge on patents and Patent Rights in India.
- The about current trends in entrepreneurship development.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental aspects of IPR.	K1
CO2	Get awareness of acquiring the patents and copy rights.	K2
CO3	Recognize about the copyrights and trade marks.	K2
CO4	Understand the basics of business and entrepreneurship.	K3
CO5	Explore small business ideas and business plan.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	S	S	M	L	M
CO4	M	S	M	M	M
CO5	M	S	M	M	M

S   Strong   M   Medium   L   Low

193BC1A6AA	AECC - VI: INNOVATION, IPR & ENTREPRENEURSHIP	**SEMESTER** VI

Total Credits: 2

Total Instruction Hours: 24 h

Syllabus

Unit I   Intellectual Property and World Trade Organization (WTO)   5 h

Definition of Intellectual Property - Introduction of WTO-Agreement on TRIPS(Trade Related Intellectual Property Rights) - General Provisions and Basic Principles of TRIPS - Standards Concerning the Availability-Scope and Use of Intellectual Property Rights - Enforcement of Intellectual Property Rights.

Unit II   Patent   5 h

Definition - History of the Patent in India - Conditions for Grant of Patent – Inventions those are not Patentable - Process and Product Patent - Procedure for Grant of Patent – e-Filing of Patent Application - Temporal and Spatial Aspect of Patent - Opposition to Grant of Patent - Rights of Patentee - Patent Office and Register of Patents - PCT Patent

Unit III   Copyright and Trade Marks   5 h

Copyright: Definition - Meaning of Publication - Copyright Office and Copyright Board - Ownership of Copyright - The Rights of the Owner - Term of Copyright - Registration of Copyright- Trade Marks: Definition - Developing a Trade Mark - Conditions for Trade Mark Registration - Register of Trade Marks - Trends in Trade Marks Applications- Procedure for Trade Mark Registration in India.

Unit IV   Entrepreneurship and Entrepreneurial Skills   4 h

Basic Business Concepts for the Prospective Entrepreneur- Definitions of an Entrepreneur - The Relationship between Entrepreneurship and Small Business Management - Key Characteristics of Successfu1 Entrepreneurs - Entrepreneurial skills.

Unit V   Ideas for Start-up   5 h

Introduction - Cultivating a Creative Attitude - Generating Small Business Ideas - The Generation of Ideas from the Entrepreneur's Skills - Expertise and Aptitudes – Common Needs – Existing Problems – Everyday Activities – Other Sources - The Development and Evaluation of Small Business Ideas.

Text Books

1   Nieuwenhuizen C, (2015), "Basics of Entrepreneurship", Juta Pvt. Ltd.

2   Neeraj Pandey, Khushdeep Dharani, (2014), "Intellectual Property Rights", PHI Learning Pvt. Ltd.

References

1   Deborah. E. Bouchoux, (2018), "Intellectual Property Right", (5th Edn.), Cengage Learning.

2   Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, (2018), "Entrepreneurship", (10th Edn.), Tata McGraw Hill.

3   Prabuddha Ganguli, (2008), "Intellectual Property Right", (1st Edn.), Tata McGraw Hill.