



**YENEPOYA**

(DEEMED TO BE UNIVERSITY)

Recognized under Sec 3(A) of the UGC Act 1956

Accredited by NAAC with 'A' Grade

## **YENEPOYA (DEEMED TO BE UNIVERSITY)**

**Deralakatte, Mangaluru -575018**

**REGULATIONS AND CURRICULUM GOVERNING**

**UNDERGRADUATE PROGRAM**

**BACHELOR OF COMPUTER APPLICATION (BCA)**

**(BIG DATA ANALYTICS AND CLOUD COMPUTING)**

**(CURRICULUM - EFFECTIVE FROM 2019-20)**

**ATTESTED**

**Dr.Gangadhara Somayaji K.S.**  
Registrar  
Yenepoya(Deemed to be University)  
University Road, Deralakatte  
Mangalore- 575 018, Karnataka

**NOTIFICATION – 34-ACM/2019 dtd.01.06.2019**

Sub: Proposal for starting programmes and approval for the Regulations and Curriculum

- (1) BBA ( Aviation & Logistics)
- (2) BBA (Aviation, Travel & Tourism)
- (3) B.Com (Honors) (ACCA)
- (4) BCA (Big Data Analytics and Cloud Computing)
- (5) B.Sc. Hospital Science (Aviation, Travel and Tourism)
- (6) B.Sc. Food Science and Nutrition
- (7) Bachelor of Hotel Management

Ref: Resolution of the Academic Council at its 34<sup>th</sup> meeting held on  
08.02.2019, vide agenda 39

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The Academic Council at its 34<sup>th</sup> meeting held on 08.02.2019 & subsequently the Board of Management at its 45<sup>th</sup> meeting have resolved to approve the proposal to start following programmes.

- (1) BBA ( Aviation & Logistics)
- (2) BBA (Aviation, Travel & Tourism)
- (3) B.Com (Honors) (ACCA)
- (4) BCA (Big Data Analytics and Cloud Computing)
- (5) B.Sc. Hospital Science (Aviation, Travel and Tourism)
- (6) B.Sc. Food Science and Nutrition
- (7) Bachelor of Hotel Management

The Regulations and Curriculum of the above programmes have been approved.

This notification issued for implementation with effect from the academic year 2019-20.

  
**REGISTRAR**  
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To:

The Principal, Yenepoya Institute of Arts, Science, Commerce & Management

Copy to:

Controller of Examinations/File copy

## **BCA (Big Data Analytics and Cloud Computing)**

The University Grants Commission, New Delhi in its tenth plan guidelines directed the Universities in the country to implement the credit based semester scheme in both under-graduate and post-graduate programmes. The Credit Based Semester Scheme, makes the product of a University at par with the global practices in terms of academic standards and evaluation strategies. In the emerging scenario of Internationalization of Indian Higher Education, it is imperative that the Universities in India should follow this system so that the mobility of their products both within and across the geographical jurisdiction becomes possible. Hence the Yenepoya University is adopting the credit based semester scheme in its undergraduate degree programme of BCA (Big Data Analytics and Cloud Computing) effective from the academic year 2019-20.

BCA is one of the popular courses among the students who want to make their career in the IT (Information Technology) field. The duration of the course is 3 years and divided into 6 semesters. It comprises of the subjects like database, networking, data structure, core programming languages like 'C' and 'java'. This course provides a lot of opportunities to the students who are interested in computer field and wants to work in the IT sector as programmer or software developer. To get complete knowledge about the course and career scope, you can go through this article. This increasing growth of IT industry has created a lot of opportunities for the computer graduates. BCA course is often seen as a course equivalent to B.E. or B.Tech. in Computer Science. This course provides the required skills and enables the students to get them employed in the Information Technology (IT) sector. After the successful completion of BCA, a student will be able to choose from numerous career options in various fields like Software development, ITES, Banks, Education, Government departments etc. The employability factor for a BCA graduate is also very high - a chief information officer, computer programmer, computer support service specialist, computer scientist, computer systems analyst, database administration, Information systems manager, software developer, software publisher, systems administrator, teacher or lecturer in any organisation. However, if someone is willing to work in government organisation there is a vacancy there as well. After BCA one can join government banks as clerks, probationary officer, short service commission for Navy or Army, IAS, IPS, CBI, Group examinations, RRB or UPSC.

The demand for Analytics skill is going up steadily but there is a huge deficit on the supply side. This is happening globally and is not restricted to any part of geography. In spite of Big Data Analytics being a 'Hot' job, there is still a large number of unfilled jobs across the globe due to shortage of required skill. A McKinsey Global Institute study states that the US will face a shortage of about 190,000 data scientists and 1.5 million managers and analysts who can understand and make decisions using Big Data by the coming years. India currently has the highest concentration of analytics globally. In spite of this, the scarcity of data analytics talent is particularly acute and demand for talent is expected to be on the higher side as more global organizations are outsourcing their work.

According to Srikanth Velamakanni, co-founder and CEO of Fractal Analytics, there are two types of talent deficits: Data Scientists, who can perform analytics and Analytics Consultant, who can understand and use data. The talent supply for these job titles, especially Data Scientists is extremely scarce and the demand is huge.

Strong demand for Data Analytics skills is boosting the wages for qualified professionals and making Big Data pay big bucks for the right skill. This phenomenon is being seen globally where countries like Australia and the U.K are witnessing this 'Moolah Marathon'.

According to the 2015 Skills and Salary Survey Report published by the Institute of Analytics Professionals of Australia (IAPA), the annual median salary for data analysts is \$130,000, up four per cent from last year. Continuing the trend set in 2013 and 2014, the median respondent earns 184% of the Australian full-time median salary. The rising demand for analytics professionals is also reflected in IAPA's membership, which has grown to more than 5000 members in Australia since its formation in 2006.

Randstad states that the annual pay hikes for Analytics professionals in India is on an average 50% more than other IT professionals. According to *The Indian Analytics Industry Salary Trend Report* by Great Lakes Institute of Management, the average salaries for analytics professionals in India were up by 21% in 2015 as compared to 2014. The report also states that 14% of all analytics professionals get a salary of more than Rs. 15 lakh per annum.

A look at the salary trend for Big Data Analytics in the UK also indicates a positive and exponential growth. A quick search on Itjobswatch.co.uk shows a median salary of £62,500 in early 2016 for Big Data Analytics jobs, as compared to £55,000 in the same period in 2015. Also, a year-on-year median salary change of +13.63% is observed.

The BCA programme that we offer comes in with an added benefit of Big Data Analytics and Cloud Computing which benefits the students in multiple ways. While Analytics play an important role in driving business strategy and making effective business decisions, Cloud Computing is a significant aspect of the information technology that has made lives of people easier and simpler. Cloud Computing refers to all the Internet-based services, applications and development. IBM defines Cloud Computing as 'computing as a service over the Internet' that allows storing of great volumes of data, sans the possibility of losing the same. Cloud Computing or 'the cloud' refers to pooling of technology resources for the delivery of centralized data storing and access services over the Internet.

Cloud Computing is a fast emerging business standard. Enterprises find it beneficial in several ways. Cloud Computing simplifies accessibility, provides virtual storage space, addresses backup issues, it provides security against unauthorized access and loss of data. Key advantage is that users can pay only for the resources they have used on 'the cloud' and do away with the major investments for data storage, software licenses, servers and hardware.

According to an IBM statistic about 85% of new applications are being developed around Cloud Computing. The industry is expected to grow tremendously, driven mainly by the services that allow users to backup their files including photos and music, while ensuring easy availability of files in cases of hard drive crash. Studies by NASDAQ indicate that investments in cloud technology are likely to expand over US\$ 40 million by the next few years.

According to the statistics provided by the Market Research Media, the worldwide market for Cloud Computing is likely to grow at a CAGR of 30% to reach US\$ 270 billion through the year 2020. Considering the cutting-edge innovations and new industry-specific applications, Cloud Computing is fast emerging as an essential component of an enterprise's IT framework.

Organizations, both big and small have deployed the cloud technology in some suitable capacity. Enterprises need expert IT professionals to work around 'the cloud'. The Cloud Computing industry requires professionals with adept training and knowledge in both technical and managerial fields. The demand for IT professionals continues to rise at an exponential rate as more and more enterprises adopt Cloud Computing.

Aspirants focused on taking a plunge into the Cloud can choose from a range of career paths such as Cloud architects, Cloud engineers, Cloud security experts, Cloud developers, Cloud support analysts to name a few. Similar to all other IT jobs, jobs in the Cloud Computing stream

involve considerably high pay packages. Even the entry level jobs receive fat pay packages, making the sector more lucrative for ambitious professionals.

Information Technology is an area where the youngsters of India concentrate on. A degree in the subject may be awarded either by a university college dedicated to the studies of Computer Science with a relevant department. Degrees conferred in this academic field include MCA, MBA and PhD. Bachelor of Computer Applications is very popular academic degree in all over the world.

A combination of Computer Applications, Big Data Analytics and Cloud Computing are taking place in the degrees that we propose to offer. This sector is predicted to become the world's largest industry by the year 2020, generating enormous opportunities for well qualified individuals armed with credentials from an elite institute like Yenepoya University. These Graduates will be in great demand to assume exciting and rewarding positions anywhere in the World.

BCA degree holders get a better chance for pursuing MBA and MCA. The added specializations like Big Data Analytics and Cloud Computing would provide the students of Dakshina Kannada district ample chances to work in their home town, Mangalore as well as nearby places. Being in a coastal town where the major revenue comes from exports, the students completing their degree programme would stand a better chance of getting employed in the shipping, aviation, exports and imports and other allied industries. Many foreign countries prefer hiring people from India to manage their most difficult asset – human resource. High earning jobs are spread in US, UK, Canada and Middle East markets, and our specializations would offer our students a better chance at gaining employment abroad. Seekers of all these programmes have the lowest injury rates while in employment.

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#### **GOAL:**

To providing students with the skills, knowledge and values to have successful careers and lead the organisations they work with into the future. The program is designed to students in Computer science and Information technology with emphasis on hands-on practical training in software development.

#### **OBJECTIVES:**

Yenepoya University proposes to conduct BCA (Big Data Analytics and Cloud Computing); course with the following objectives;

- 1) To provide a strong foundation and understanding of the functioning of IT organizations, business organizations, commercial transactions and of various specialized operations such as accounting, finance and marketing by offering a comprehensive curriculum.
- 2) To develop professional knowledge and skills in Computer system architecture, internet technologies, cloud computing, big data analytics, artificial intelligence, etc. by adopting learner centered pedagogical practices.
- 3) To develop competency in students to pursue higher level programmes such as MCA, MBA, etc.
- 4) To enhance employ ability and to be able to take up challenging job assignments.
- 5) To develop the conceptual and practical skills of the students aimed at the intellectual pursuit of knowledge of Computer system architecture, internet technologies, cloud computing, big data analytics, artificial intelligence.
- 6) To help understand methods and processes of information technology in every area of activity.

- 7) To expose them to the areas of application of knowledge in business firms and industrial organizations.
- 8) To enable them to acquire complete basic and intermediary practical knowledge of various computer science related subjects with the sole purpose of making them self-dependent and easily employable.

**ACADEMIC YEAR OF ADOPTING THE SYLLABUS:**

**This programme will be implemented with effect from the academic year 2019-20 onwards.**

**DURATION OF THE COURSE:**

The duration of the course shall be three years. Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year, the third and fourth semesters, and the third academic year as the fifth and sixth semesters.

**ELIGIBILITY FOR ADMISSION:**

A candidate who has passed the two years Pre-University Examination conducted by the Pre-University Education Board in the State of Karnataka or any other examination considered as equivalent thereto by University is eligible for admission to these programmes.

**SELECTION PROCESS:**

Application forms will be available in the official website of Yenepoya University ([www.yenepoya.edu.in](http://www.yenepoya.edu.in)) and the college office for the applicants. A merit list will be prepared of selected candidates based on the 12<sup>th</sup> class marks /PUC marks. Reservation of seats will be followed as per the university Bye Laws.

**TOTAL INTAKE OF STUDENTS:**

150 students will be registered per year for the course.

**MEDIUM OF INSTRUCTION:** The medium of instruction and examination shall be English.

**References: Only latest editions of books/ journals would be used, wherever applicable.**

## **CHOICE BASED CREDIT SYSTEM (CBCS):**

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

### **Outline of Choice Based Credit System:**

**1. Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

**2. Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

**2.1 Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

**2.2 Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

**2.3 Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

**3. Ability Enhancement Courses (AEC)/Competency Improvement Courses/Skill Development Courses/Foundation Course:** The Ability Enhancement (AE) Courses may be of two kinds: AE Compulsory Course (AECC) and AE Elective Course (AEEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement. They ((i) Environmental Science, (ii) English/MIL Communication) are mandatory for all disciplines. AEEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

**3.1 AE Compulsory Course (AECC):** Environmental Science, English Communication/MIL Communication.

**3.2 AE Elective Course (AEEC):** These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction. Project

work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem.

A **Project/Dissertation work** would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

#### 4. Details of courses under BCA (Big Data Analytics and Cloud Computing)

Course	*Credits	
	Theory+ Practical	Theory + Tutorial
<b>I. Core Course (14 Papers)</b>	14X4= 56	14X5=70
<b>Core Course Practical / Tutorial* (14 Papers)</b>	14X2=28	14X1=14
<b>II. Elective Course (8 Papers)</b>		
<b>A.1. Discipline Specific Elective (4 Papers)</b>	4X4=16	4X5=20
<b>A.2. Discipline Specific Elective Practical / Tutorials* (4 Papers)</b>	4 X 2=8	4X1=4
<b>B.1. Generic Elective/ Interdisciplinary (4 Papers)</b>	4X4=16	4X5=20
<b>B.2. Generic Elective Practical / Tutorials* (4 Papers)</b>	4 X 2=8 4X1=4	4x1=4
<b>*Optional Dissertation or project work in place of one Discipline Specific elective paper (6 credits) in 6th Semester</b>		
<b>III. Ability Enhancement Courses</b>		
<b>1. Ability Enhancement Compulsory Courses (AECC) (2 Papers of 4 credits each)</b>	2 X 2=4	2 X 2=4
Environmental Science English Communication/MIL		
<b>2. Skill Enhancement Courses (SEC) (Minimum 2, Max. 4) (2 Papers of 4 credits each)</b>	2 X 2=4	2 X 2=4
	<b>Total credit= 140</b>	<b>Total credit= 140</b>

Institute should evolve a system/policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own. \*wherever there is a practical there will be no tutorial and vice-versa.



## **5. Co-Curricular and Extra Curricular Activities**

A student shall opt for any one of the following activities in the first four semesters offered in the college

A) N.S.S.

B) Sports and Games

C) Other Co-Curricular and Extra-Curricular Activities as prescribed by the university evaluation of Co-and Extra Curricular Activities is as per the procedure evolved by the university from time to time.

## **6. Attendance and Change of Subjects**

A candidate shall be considered to have satisfied the requirement of attendance for a semester if he/she attends not less than 75% of the number of classes held including EC & CC.

A candidate who does not satisfy the requirement of attendance even in one subject shall not be permitted to take the whole University examination of that semester and he/she shall seek re-admission to that Semester in a subsequent year.

Whenever a change in a subject is permitted the attendance in the changed subject shall be calculated by taking into consideration the attendance in the previous subject studied by the candidate.

If a candidate represents his/her Institution/University/ Karnataka State/ Nation in Sports/ NSS/ Cultural or any officially sponsored activities he/she may be permitted to claim attendance for actual number of days participated, based on the recommendation of the Head of the Institution concerned. If a candidate is selected to participate in national level events such as Republic Day Parade etc., he/she may be permitted to claim attendance for actual number of days participation based on the recommendation of the head of the Institution concerned.

## **7. Teaching Learning Methodology**

The instructors will choose the pedagogy according to the course content and its applications from the methods provided below:

Lectures, class discussions, reading assignments, discussion groups. Lecture-demonstration, Student Presentation, Panel discussion by student panels from the class. Student reports by individuals, Student-group reports. Debate (informal) on current issues by students Forums Bulletin boards, Small groups such as task oriented, discussion, Textbook assignment. Reading assignments in journals, monographs, Assignment to outline portions of the textbook, Assignment to outline certain supplementary readings, Debates (formal) . Crossword puzzles Maintaining Portfolios / Diaries. Reports on published research studies, Library research on topics or problems .Written book reports by students , Interviews, Audio-tutorial lessons , Open textbook study, committee projects--small groups ,Individual projects , Quiz, Use of dramatization, skits, plays(street plays) ,Student construction of diagrams, charts, or graphs, Making of posters by students , Problem solving or case studies. Use of flip chart board by instructor as aid in teaching, Use of diagrams, tables, graphs, and charts by instructor in teaching. Use of displays by instructor, Use of slides, Use of motion pictures, educational films, videotapes, use of recordings (Ted Talks), role playing, peer teaching. Coaching: special assistance provided for students having difficulty in the course .VIVA, filling out forms (income tax, checks). Visit an "ethnic" locations or commercial establishments or community. On the job training, specialize in other countries and in India, visit to an employment agency, campaigning, volunteering, preparing mock newspaper on specific topic or area, an entrepreneurial activity, and writing reports or project proposals.

### 8. Examination Structure for written exam

	Marks
Internal Assessment	25
Final Examination	75
Total	100

### 9. Continuous Internal Assessment (CIA)

Internal Assessment for each course is continuous, and details for each test are notified well in advance. CIA consists of the following

SN	Internal Assessment for 25 marks	Marks
1	One Internal Written examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/ Class Interaction/Attitude	10

10. The marks of the internal assessment shall be published on the notice board of the college for information of the students.

### 11. Registration for Examinations

A candidate shall register for all the papers of a semester when he/she appears for the examination of that semester for the first time.

### 12. Conduct of Examinations

There shall be examinations at the end of each semester, ordinarily during November/December for odd semesters and during April/May for even semesters, as prescribed in the Scheme of Examinations.

### 13. Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/case studies/essay type questions	1 Questions x 15 marks each	15 Marks
Total			50 Marks

### 14. Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/case studies/essay type questions	2 Questions x 15 marks each	30 Marks
Total			75 Marks

**Question Paper Pattern for End Semester Examination**

**Duration: 3Hours**

**Max. Marks: 75**

**Section – A**

**Answer the following questions:**

**(1x15=15 Marks)**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

**Section – B**

**Answer any THREE of the following:**

**(10x3=30 Marks)**

- 16
- 17
- 18
- 19
- 20

**Section – C**

**Answer any TWO of the following:**

**(15x2=30 Marks)**

- 21
- 22
- 23
- 24

### **15. Minimum for a Pass**

No candidate shall be declared to have passed the Semester Examination (except in Co-curricular and extracurricular activities) unless he/she obtains not less than 40% marks in the aggregate of written examination and internal assessment put together in each of the subjects. There is no minimum mark in Internal Assessment, but Candidate should get minimum 40% in external examination.

If a candidate fails in any subjects, he/she shall appear for that subject only at any subsequent regular examination, within the maximum 6 years from date of registration prescribed for completing the programme.

### **16. Re-totaling**

All theory examination papers will be evaluated by two examiners (one internal and one external). There will not be any revaluation of the papers. However the students can apply for re-totaling after submitting the application and necessary fees.

### **17. With holding of Results**

Results will be withheld when a student has not paid his/her dues or there is a case of disciplinary action pending against him/her.

### **18. Carry Over**

A candidate who fails in a lower semester examination may go to the higher semester and take the examination.

### **19. Classification of Successful Candidates**

Grading System For Choice Based Credit System (CBCS) - The College adopts a ten point grading system.

Conversion of credit(s) into grade(s) the following illustrations could be taken as an example for computing SGPA and CGPA from credits for Honours courses in all disciplines, degree Program courses in Science subjects and degree Program courses in Humanities, Social Sciences and Commerce subjects

### **20. Grades and Grade Points**

<b>Letter Grade</b>	<b>Grade Point</b>
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B ( above average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

For non-credit courses ‘Satisfactory’ or ‘Unsatisfactory’ shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

The Universities can decide on the grade or percentage of marks required to pass in a course and also the CGPA required to qualify for a degree taking into consideration the recommendations of the statutory professional councils such as AICTE, MCI, BCI, NCTE etc.

## 21. Illustration of Computation of SGPA and CGPA and Format for Transcripts Honors Course

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
<b>Semester I</b>					
C-1	06	A	8	48	
C-2	06	B+	7	42	
AECC-1	02	B	6	12	
GE-1	06	B	6	36	
<b>Total</b>	<b>20</b>			<b>138</b>	<b>6.9 (138/20)</b>
<b>Semester II</b>					
C-3	06	B	6	36	
C-4	06	C	5	30	
AECC -2	02	B+	7	14	
GE-2	06	A+	9	54	
<b>Total</b>	<b>20</b>			<b>134</b>	<b>6.7 (134/20)</b>
<b>Semester III</b>					
C-5	06	A+	9	54	
C-6	06	O	10	60	
C-7	06	A	8	48	
SEC -1	02	A	8	16	
GE-3	06	O	10	60	
<b>Total</b>	<b>26</b>			<b>238</b>	<b>9.15 (238/26)</b>
<b>Semester IV</b>					
C-8	06	B	6	36	
C-9	06	A+	9	54	
C-10	06	B	6	36	
SEC -2	02	A+	9	18	

GE-4	06	A	8	48	
<b>Total</b>	<b>26</b>			<b>192</b>	<b>7.38 (192/26)</b>
<b>Semester V</b>					
C-11	06	B	6	36	
C-12	06	B+	7	42	
DSE-1	06	0	10	60	
DSE-2	06	A	8	48	
<b>Total</b>	<b>24</b>			<b>186</b>	<b>7.75 (186/24)</b>
<b>Semester VI</b>					
C-13	06	A+	9	54	
C-14	06	A	8	48	
DSE-3	06	B+	7	42	
DSE-4	06	A	8	48	
<b>Total</b>	<b>24</b>			<b>192</b>	<b>8.0 (192/24)</b>
<b>CGPA</b>					
<b>Grand Total</b>	<b>140</b>			<b>1080</b>	<b>7.71 (1080/144)</b>

Semester 1	Semester 2	Semester 3	Semester 4
Credit 20; SGPA 6.9	Credit 20; SGPA 6.7	Credit 26; SGPA 9.15	Credit 26; SGPA 7.38
<b>Semester 5</b>			
Credit 24; SGPA 7.75	Credit 24; SGPA 8.0		

**Thus, CGPA = (20 x 6.9 + 20 x 6.7 + 26 x 9.15 + 26 x 7.38 + 24 x 7.75 + 24 x 8.0) / 140 = 7.71**

## 22. Rejection of Results

A candidate may be permitted to reject the result of the whole examination of any semester. Rejection of result paper-wise/subject-wise shall not be permitted. A candidate who has rejected the result shall appear for the immediately following regular examination.

The rejection shall be exercised only once in each semester and the rejection once exercised cannot be revoked.

Application for rejection along with the payment of the prescribed fee shall be submitted together to the controller of examination of university through the College with the original statement of marks within 30 days from the date of publication of the result.

A candidate who rejects the result is eligible for only class and not for ranking.

### **23. Transfer of Admission**

Transfer of admissions to other university is permissible only on mutual agreement with the other university. A candidate migrating from any other university may be permitted to join III/V Semester of the degree programme provided he/she has passed all the subjects of previous semesters/years as the case may be. Such candidates must satisfy all other conditions of eligibility stipulated in the regulations of Yenepoya University. Conditions for transfer of admission of students of other universities

He/she shall fulfil the attendance requirements as per the Yenepoya University Regulations.

His / Her transfer of admission shall be within the intake permitted to the college.

The candidate who is migrating from other universities is eligible for overall class and not for ranking. He/She shall complete the programme as per the regulation governing the maximum duration of completing the programme

**THE COURSE CONTENT, INSTRUCTION HRS AND ASSESSMENT  
DETAILS: BCA (Big Data Analytics and Cloud Computing)**

Sl.No	Subject Code	Name of the course	Course Theory type	Credits Hours			Total credits
				Tutorial	Practical		
<b>SEMESTER I</b>							
1.	DC01BD-1C1	C1- Programming Fundamentals using C++	Core course	4	0	4	6
2.	DC01BD-1C2	C 2 - Computer System Architecture	Core course	4	0	4	6
3.	DC01BD-1A1	English Communication	Ability enhancement compulsory course	2	0	0	2
	DC01BD-1A2	Hindi					
	DC01BD-1A3	Kannada					
4.	DC01BD-1G1	GE 1 – Soft Skills	Elective Generic	5	1	0	6
TOTAL				15	01	08	20
<b>SEMESTER II</b>							
5.	DC01BD-2C1	C 3 – Data Structures	Core course	5	1	0	6
6.	DC01BD-2C2	C 4 – Programming in Java	Core course	4	0	4	6
7.	DC01BD-2C3	Environmental Studies	Ability enhancement compulsory course	2	0	0	2
8.	DC01BD-2G1	GE 2- Statistical Techniques with ‘R’	Elective Generic	5	1	0	6
TOTAL				16	2	4	20
<b>SEMESTER III</b>							
9.	DC01BD-3C1	C 5 – Data Base Management System	Core course	4	0	4	6



10.	DC01BD-3C2	C 6 – Object Oriented Analysis	Core course	5	1	0	6
11.	DC01BD-3C3	C 7 – Operating System and Computer Networks	Core course	4	0	4	6
12.	DC01BD-3S1	SEC – 1 Research Methodology	Skill Enhancement Course	2	0	0	2
13.	DC01BD-3G1	GE3– Web Application and Development	Elective Generic	4	0	4	6
<b>TOTAL</b>				<b>19</b>	<b>01</b>	<b>12</b>	<b>26</b>

**SEMESTER IV**

14.	DC01BD-4C1	C 8 – Software Engineering	Core course	5	1	0	6
15.	DC01BD-4C2	C 9 – Mobile Applications and Development Using Android	Core course	5	1	0	6
16.	DC01BD-4C3	C 10 – Data warehousing and Mining	Core course	5	1	0	6
17.	DC01BD-4S1	SEC – 2 Entrepreneurship	Skill Enhancement Course	2	0	0	2
18.	DC01BD-4G1	GE 4 – Mini Project	Elective Generic	0	0	6	6
<b>TOTAL</b>				<b>17</b>	<b>03</b>	<b>06</b>	<b>26</b>

**SEMESTER V**

19.	DC01BD-5C1	C 11- Foundation of Big Data System	Core course	5	1	0	6
20.	DC01BD-5C2	C 12- Foundation of Data Analytics	Core course	5	1	0	6

21.	DC01BD-5S1	SEC– Cloud Computing	Skill Enhancement Course	2	0	0	2
22.	DC01BD-5D1	DSE 1 – Cryptography and Network Security	Discipline Elective	5	1	0	6
23.	DC01BD-5D2	DSE 2- Programming Using Python	Discipline specific Elective	4	0	4	6
TOTAL				21	03	04	26
<b>VI SEMESTER</b>							
24.	DC01BD-6C1	C 13 – Big Data Analytics with Hadoop	Core course	5	1	0	6
25.	DC01BD-6C2	C 14 – Artificial Intelligence	Core course	5	1	0	6
26.	DC01BD-6S1	SEC 4 – Industry Academia Interaction	Skill Enhancement Course	2	0	0	2
27.	DC01BD-6D1	DSE 3 – Processing Real Time Big Data	Discipline specific Elective	5	1	0	6
28.	DC01BD-6D2	DSE 4 – Project	Discipline specific Elective	0	0	12	12
TOTAL							32
Total Credits							150

**Assessment (for all the above listed courses except DC01BD-6D1, DC01BD-6D2):**

Practical	Marks	Theory			Grand Total
		Internal	External	Total	(Marks obtained in Practical + Marks obtained in Theory) /2
Continuous Assessment	100	25	75	100	100

## Evaluation Policy: Theory Papers (100 marks)

- Internal Assessment – 25 marks
  - Internal 1 – Assignment/ seminar/ viva/ research paper for 10 marks. –
  - Internal 2 – Examination for 10 marks.
  - Attendance – 5 marks according to the below mentioned categorization.
    - Above 95% - 5 marks
    - 90-94% - 4 marks
    - 85-89% - 3 marks
    - 80-84 % - 2 marks
    - 75-79% - 1 mark.
  
- External Assessment – 75 marks
  - Section A: Objective Type Questions for 25 marks
    - 25x1= 25 marks.
  - Section B: Analytical/Essay/ Case study questions for 50 marks.
    - 5x10= 50 marks.

Minimum Pass Marks Required for Each Subject – 40 Marks

### For GE 4 – Mini Project

The student shall work for 20 hours in industry under the guidance of a faculty member of his/ her department on a particular topic agreed mutually by them which would be called as a project. A report has to be submitted which shall be assessed followed by a viva voce examination. The student would also have to do a presentation before submitting the report on the completion of the project. The total number of hours for the project submission, presentation and viva is ten hours.

Si. No.	Details	Hours
1.	Working on a project	20
2.	Report, Presentation, Viva	10
	Total	30

**For the above mentioned paper, the internal marks would be allotted as per continuous assessment pattern dependent on the progress of the project, and brilliance of presentation and report/ viva voce etc. There would not be any written examination for these two courses.**

**The Marks division are as follows:**

Courses	Details	Total Marks
GE 4 - Summer Internship Project	Successful completion of project - 50 marks Presentation - 15 marks Project Report - 20 marks Viva - 15 marks	100 marks

## DC01BD-1C1 Programming Fundamentals Using C++

### THEORY

Total Time -60 hours

#### Goal:

This course covers object-oriented programming principles and techniques using C++. Topics include pointers, classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low level language features. This course also covers basic concepts for software design and reuse.

#### Course Objectives:

1. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
3. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.

#### Course Outcomes:

1. Understand concepts of objects and their significance in real world
2. Investigate software problem in terms of objects and entities
3. Learn to co-relate relationship among different entities involved in a system
4. Find dependency and roles in an environment
5. Develop software in terms of objects, associations, and integrity constraints
6. Generalize and aggregate business entities and transform behavior into functions
7. Identify, understand and analyze various sample development models

#### Unit 1

##### Principles of OOP

Software Crisis. Software Evolution- Programming Paradigms. Object Oriented Technology- Basic concepts and benefits of OOP – Application of OOP, OOP Languages.

**Introduction to C++:** History of C++, Structure of C++, Application of C++, tokens, keywords, identifiers, basic data types, derived data types, derived data types, symbolic constant, dynamic initialization, reference variables, scope resolution operator, type modifiers, type casting operators and control statements, input and output statements in C++, Function prototyping and components, Passing parameters: Call by reference, Return by reference, Inline function, Default arguments, Over loaded function.

#### Unit 2

**Classes and Objects:** Class specification, Member function definition – nested member function, access qualifiers, static data members and, member functions. Instance creation – Array of objects - Dynamic objects - Static Objects – Objects as arguments -Returning objects

**Constructors and Destructors:** Constructors- Parameterized constructors, Overloaded Constructors, Constructors with default arguments, copy constructors, Destructors.

### Unit 3

**Operator Overloading:** Operator function-overloading unary and binary operators, overloading the operator using Friend function, Stream operator overloading, Data conversion.

**Inheritance:** Defining derived classes. Single Inheritance - Protected data with private inheritance - Multiple Inheritances - Multi Level Inheritance - Hierarchical Inheritance. Hybrid Inheritance - Multi path Inheritance - Constructors in derived and base Class -Template in Inheritance - Abstract classes - Virtual function and Dynamic polymorphism. - Virtual destructor - Nested Classes.

### Unit 4

**Functions in C++ :** Virtual functions- need for Virtual function, , Pure Virtual functions, Generic Programming with Templates. Introduction, function templates, overloaded function templates, user defined templates arguments, class templates, Inheritance of class templates.

### Unit 5

**File Handling:** Files: file stream, file pointer and manipulation, file open and close, sequential and random access.

**Exception Handling:** Principle of Exception handling, Exception handling mechanism, multiple catch, Nested try, re throwing the Exception.

### Suggested Reading:

- Thareja, Reema. (2015). *Object Oriented Programming with C++* . Oxford University Press
- Schildt, Herb. (2002). *The Complete Reference C++* . Tata McGraw-Hill, Fourth Edition.
- Rberto Lafore, (2002). *Object Oriented Programming in C++*. 4<sup>th</sup> Ed. Galgotia Publication.
- Ashok N Kamathane. (2003). *Object Oriented Programming with ANSI & Turbo C++*, Pearson.
- Bjarne Stroustrup, (2001). *C++ Programming language*, Pearson.
- Venugopal K R, Rajkumar Buyya and Ravishankar T. (2006). *Mastering C++*, TMH.

## **PRACTICAL**

**Total Time - 60 hours**

### **OBJECT ORIENTED PROGRAMMING USING C++ LAB**

1. Write a C++ program to find the sum of individual digits of a positive integer.
2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence.
3. Write a C++ program to generate all the prime numbers between 1 and n , where n is a value supplied by the user.
4. Write a C++ program to find the factorial of a given integer 5. Write a C++ program to find the GCD of two given integers
5. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.
6. Write a C++ program to implement call by value and call by reference parameters passing
7. Write a C++ program to implement function templates
8. Write a program to implement Overloading and Overriding
9. Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are:
  - a. Reading a matrix.
  - b. Printing a matrix
  - c. Addition of matrices
  - d. Subtraction of matrices
  - e. Multiplication of matrices
10. Write C++ programs that illustrate how the Single inheritance, Multiple inheritance Multi level inheritance and Hierarchical inheritance forms of inheritance are supported.
11. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class
12. Write a C++ program that illustrates how run time polymorphism is achieved using virtual functions

## DC01BD-1C2 Computer System Architecture

### THEORY

Total Time – 60 hours

#### Goal:

The purpose of the course is to familiarise the students with the basic knowledge of the construction and work of the computer system and with the low - level programming skills.

#### Course Objectives:

1. To conceptualize the basics of organizational and architectural issues of a digital computer.
2. To analyze performance issues in processor and memory design of a digital computer.
3. To understand various data transfer techniques in digital computer.
4. To analyze processor performance improvement using instruction level parallelism

#### Course Outcomes

1. Ability to understand basic structure of computer.
2. Ability to perform computer arithmetic operations.
3. Ability to understand control unit operations.
4. Ability to design memory organization that uses banks for different word size operations.
5. Ability to understand the concept of cache mapping techniques.
6. Ability to understand the concept of I/O organization.
7. Ability to conceptualize instruction level parallelism.

#### Unit 1

**Introduction:** Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

#### Unit 2

**Data Representation and Basic Computer Arithmetic:** Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

#### Unit 3

**Basic Computer Organization and Design:** Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

#### Unit 4

**Central Processing Unit:** Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

#### Unit 5

**Memory Organization:** Cache memory, Associative memory, mapping.

## Unit 6

**Input-Output Organization:** Input / Output: External Devices, I/O Units, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

### Suggested Reading

- M. Mano. (1992). *Computer System Architecture*, Pearson.
- A. J. Dos Reis (2004). *Assembly Language and Computer Architecture using C++ and JAVA*, Course Technology,
- W. Stallings. (2009). *Computer Organization and Architecture Designing for Performance*, 8<sup>th</sup> Ed., Prentice Hall of India.
- M.M. Mano. (2013). *Digital Design*, Pearson Education Asia.
- Carl Hamacher. (2012). *Computer Organization*, 5<sup>th</sup> Ed. McGraw Hill.

### PRACTICAL

**Total Time - 60 hours**

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. General study of Basic & Universal gates
  - a) AND
  - b) OR
  - c) NOT
  - d) NOR
  - e) NAND
  - f) XOR
  - g) XNOR
2. Simple Boolean Expression using Basic gates and Universal gates:  $A \cdot (B+A) + B \cdot A$
3. Design Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor Circuit.
4. Parallel Adder (2-bit, 3-bit) Circuit.
5. Implement logic functions in SOP form using Multiplexer.
6. Implement De-multiplexer.
7. Implement 7- Segment Display with Decoder.
8. Implement Parity Generator (Odd & Even)
9. Implement Magnitude Comparator (1-bit, 2-bit, 3-bit)
10. Circuit Design and implementation of Flip-Flops (SR, JK, D) using ICs
11. Circuit design and implementation of Decoder (2x4) and Encoder (4x2) using ICs



## DC01BD-1A1 English Communications

### **THEORY**

AECC: English Communication

**Total Time - 30 hours**

Credits: 2

### **Goal:**

Enable to read various types of texts independently, discuss them among peers and develop the ability to be well versed in English language.

### **Course Objectives:**

By the end of this course, a student will be able

1. To master communication skills in English and speak the language with fluency and accuracy.
2. To approach an issue from various points of view, and develop the habit of questioning varied views critically and objectively.
3. To make academic presentations precisely, logically and effectively and master the skills of academic writing.
4. To undertake journalistic activities like writing, editing and designing newspapers, video-graphing and anchoring news bulletins and television programmers, producing corporate films and documentaries.

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

The present course hopes to address some of these aspects through an interactive mode of teaching-learning process and by focusing on various dimensions of communication skills. Some of these are: Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc. While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science.

It is hoped that after studying this course, students will find a difference in their personal and professional interactions. The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

1. Introduction: Theory of Communication, Types and modes of Communication.
2. Language of Communication: Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication.

3. Speaking Skills: Monologue Dialogue Group Discussion Effective Communication/ Mis-Communication Interview Public Speech.
4. Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts.
5. Writing Skills Documenting Report Writing Making notes Letter writing.

**Suggested Reading:**

- Fluency in English - Part II, Oxford University Press, 2006.
- Business English, Pearson, 2008.
- Language, Literature and Creativity, Orient Blackswan, 2013.
- Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas.

सीखने के उद्देश्य

- बुनियादी सिद्धांत प्रदान करना, भाषा की तकनीकी को समझना ।
- भाषा की योग्यता को संचार रूपी उपयोग में लाना ।
- मित्रवत संवाद की योग्यता औपचारिक तथा अनौपचारिक के रूप में।

Unit 1

- भाषा का परिचय
- मूल शब्द का अवधारण
- वाक्य की संकल्पना
- भाषा का सही उपयोग (बात चीत)

Unit 2

- मौखिक रूप से औपचारिक संवाद भाग – I
- मौखिक रूप से अनौपचारिक संवाद भाग – II

Unit 3

- भाषा की संरचना भाग – I
- भाषा की संरचना भाग – II

Unit 4

लिखने की कौशल

- अनुवाद – भाग – I
- अनुवाद – भाग – II
- अनुवाद का वितरण – अंग्रेज़ी से हिंदी में अनुवाद, हिंदी से अंग्रेज़ी में अनुवाद

संदर्भ पुस्तकें :

1. Krishna Kumar Agarwal, Teach yourself hindi, 4<sup>th</sup> edn : Manoj Publications ; New Delhi ; 2018
2. Kavitha Kumar, Hindi for Non hindi speaking people, 3<sup>rd</sup> edn : Rupa Publications India Pvt Ltd ; New Delhi ; 2016

## DC01BD-1A1 Kannada

### Goal:

- To learn Kannada as a regional Language
- To know the basic grammar of the language
- To understand to communicate in Kannada

### Outcome:

- Student learns to communicate in Kannada
- Student learns the grammar of the language

### THEORY

**Total Time – 60 hours**

<b>Unit 1</b>	-	Kannada letters Kannada Alphabet, Swaragalu, Vyanjanagalu –	Author K. Damodara Ithala, Nava Karnataka Publisher
<b>Unit 2</b>	-	Technical Terms Business related words –	Kannada Shabdha sampatthu, Saathenahalli Mallikarjuna, Tanu Manu Prakashana
<b>Unit 3</b>	-	Business letters Types of formal letters, Job application –	Kannada Vyakarana Author Subha, Mesars T. Narayana Ayyangar
<b>Unit 4</b>	-	Administrative Kannada Memos, Report writing –	Kannada Shabdha Sampatthu, Saathenahalli Mallikarjuna, Tanu Manu Prakashana
<b>Unit 5</b>	-	Communicative Kannada Basic Managerial speaking skills, Listening skills –	Siddartha Margadarshi

## DC01BD-1G1 Soft Skills

**Theory + Tutorial**

**Total Time – 90 hours**

### **Goal:**

- To sharpen the Analytical, Written, non-verbal, Spoken Communication and interpersonal Skills essential in organizations involving Decision making and implementation.
- To demonstrate good team work and negotiation skills

### **Outcomes:**

At the end of the course, the candidate will be able to learn

- Honing the communication skills of the student to meet the changing and challenging demands of modern professional environment
- Reinforcing presentation skills and professionalism
- Building a strong base for good interpersonal relationship and communication skills
- Creating awareness about all areas of multiple intelligences

### **Unit 1**

**Communication in Business:** Importance of Communication, Forms of Communication, Communication Network of the Organization; Process of Communication: Different Stages, Difference between Oral and Written Communication .

**Oral Communication Skills:** Fundamentals, Barriers and Gateways, Public Speaking, Effective Power point presentation, body language, non-verbal, facial expressions, voice modulation, eye contact, audience research, questions from the audience, communication and emotional intelligence, creativity in oral communication, Communication through Telephonic, video and Skype, Group Discussion.

### **Unit 2**

**Non Verbal and Inter Cultural Communication:** Importance of non-verbal communication, personal appearance, facial expressions, movement, posture, gestures, eye contact –voice, beliefs and customs, worldview and attitude.

**Written Communication Skills:** Writing an Effective Report: Stages of Writing, Style and Tone; Five Ws and one H of Report Writing, Divisions, Numbering and use of Visual Aids, creativity in written communication, use of picture, diagram in written communication, Writing Commercial Letters, E- Mail Messages, Maintaining a Diary, Job applications & resume writing

### Unit 3

**Listening Skills:** Importance and need, types, active and empathic listening, listening and judgment, developing skills, listening and understanding, Anatomy of poor Listening, Features of a good Listener

**Communication in Business:** Systems approach, forms, functions and principles of communication, management and communication, communication patterns, barriers to communication, interpersonal perception – SWOT analysis, Johari Window, Transactional Analysis.

### Unit 4

**Interpersonal Communication skills:** Advantages and disadvantages of utilizing the team work; characteristic features of successful teams; stages of the development of a team; team roles; challenges in team working, forms of non-team behaviour. Conditions of negotiating; strategies of negotiating (win-win, win-loss); participative negotiations; negotiating tactics; cognition and emotions in negotiating; negotiating and ethics Types and sources of conflicts; the influence of various cultures on the solving of conflicts.

### Unit 5

**Business Correspondence:** Business letter, principles of business writing, memos -e-mails – agendas-minutes, sales letter, enquiries, orders, letters of complaint, claims and adjustments, notice and tenders, circulars, letters of application and résumé.

**Business Proposals and Reports:** Project proposals, characteristics and structure, Project reports – types, characteristics, structure, Appraisal reports – performance appraisal, product appraisal, Process and mechanics of report writing, visual aids, abstract, executive summary, recommendation writing, definition of terms.

### Suggested Reading:

- Monipally MM, “Business communication strategies”, McGraw Hill
- Bovee, Till and Schatzman, “Business Communication today”, Pearson Publishers
- Scot Ober, “Contemporary Business Communication”, Biztantra
- ParagDiwan, “Business Communication”, Excel Book
- Lesikar, R.V. & Flatley, M.E, “Basic Business Communication Skills for Empowering the Internet Generation”. Tata McGraw Hill Publishing Company Ltd
- Ludlow, R. & Panton, F, “The Essence of Effective Communications”. Prentice Hall of India Pvt. Ltd
- Chaturvedi P. D, & Mukesh Chaturvedi, “Business Communication : Concepts, Cases And Applications” –2/e, Pearson Education
- Murphy, “Effective Business Communication”, McGraw-hill

## DC01BD-2C1 Data Structure

### Goal:

1. To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
2. In addition, another objective of the course is to develop effective software engineering practice, emphasizing such principles as decomposition, procedural abstraction, and software reuse.

### Course Outcomes:

After completing this course satisfactorily, a student will be able to:

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and Graphs.
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.
4. Demonstrate different methods for traversing trees.
5. Compare alternative implementations of data structures with respect to performance.
6. Compare and contrast the benefits of dynamic and static data structures implementations.
7. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack.
8. Design and implement an appropriate hashing function for an application.
9. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

**Theory + Tutorial**

**Total Time – 90 hours**

### Course Contents

#### Unit 1

**Data Structures Basics:** Structure and Problem Solving, Data structures, Data structure Operations, Algorithm: complexity, Time- space tradeoff.

#### Unit 2

**Linked List:** Introduction, Linked lists, Representation of linked lists in Memory, Traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list.

#### Unit 3

**Stack and Queue:** Introduction, Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue.

#### Unit 4

**Trees:** Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal.

### **Unit 5**

**Graphs:** Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees.

### **Unit 6**

Directed Graphs Types of Directed Graphs; Binary Relation As a Digraph; Euler's Digraphs; Matrix Representation of Digraphs.

### **Unit 7**

**Applications of Graphs:** Topological Sorting, Shortest-Path Algorithms – Weighted Shortest Paths – Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm, Introduction to NP-Completeness.

### **Unit 8**

Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort', Heap sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching, Search Trees.

### **Unit 9**

**Elementary Algorithms:** Notation for Expressing Algorithms; Role and Notation for Comments; Example of an Algorithm; Problems and Instances; Characteristics of an Algorithm; Building Blocks of Algorithms; Procedure and Recursion – Procedure, Recursion; Outline of Algorithms; Specification Methods for Algorithms.

### **Unit 10**

Mathematical Functions and Notations Functions and Notations; Modular Arithmetic / Mod Function; Mathematical Expectation in Average Case Analysis; Efficiency of an Algorithm; Well Known Asymptotic Functions and Notations; Analysis of Algorithms – Simple Examples; Well Known Sorting Algorithms – Insertion sort, Bubble sort, Selection sort, Shell sort, Heap sort.

### **Unit 11**

Divide and Conquer Divide and Conquer Strategy; Binary Search; Max. And Min.; Merge sort; Quick sort.

### **Unit 12**

Greedy Method Greedy Method Strategy; Optimistic Storage on Tapes; Knapsack Problem; Job Sequencing with Deadlines; Optimal Merge Pattern; Single Source Shortlist Paths.

### **Unit 13**

Dynamic Programming Dynamic Programming Strategy; Multistage Graphs; All Pair Shortest Paths; Travelling Salesman Problems.

### **Unit 14**

Backtracking Strategy, 8-Queens Problem, Sum of Subsets, Knapsack Problem.



## DC01BD-2C2 PROGRAMMING IN JAVA

### THEORY

Total Time – 60 hours

#### Goal:

1. In this hands-on course, students gain extensive experience with Java and its object-oriented features.
2. Students learn to create robust console and GUI applications and store and retrieve data from relational databases.

#### Course Outcomes

1. Ability to write, compile and execute Java programs
2. Ability to build robust applications using Java's object-oriented features
3. Ability to create robust applications using Java class libraries
4. Ability to develop platform-independent GUIs
5. Ability to read and write data using Java streams
6. Ability to retrieve data from a relational database with JDBC

#### Unit 1

**Introduction to Java:** Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods)

#### Unit 2

**Arrays, Strings and I/O:** Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

#### Unit 3

**Object-Oriented Programming Overview:** Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

#### Unit 4

**Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata:** Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

#### Unit 5

**Exception Handling, Threading, Networking and Database Connectivity:** Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

## Unit 6

**Applets and Event Handling: Java Applets:** Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

### Suggested Reading

- Ken Arnold, James Gosling, David Homes. (2005). *The Java Programming Language*, 4<sup>th</sup> Ed.
- James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley. (2014). *The Java Language Specification, Java SE 8<sup>th</sup> Ed. (Java Series)*, Addison Wesley.
- Joshua Bloch. (2008). *Effective Java 2<sup>nd</sup> Ed.* Addison-Wesley.
- Cay S. Horstmann, Gary Cornell. (2012). *Core Java 2 Volume 1*, 9<sup>th</sup> Ed. Prentice Hall.
- Cay S. Horstmann, Gary Cornell. (2013). *Core Java 2 Volume 2 – (Advanced Features)*, 9<sup>th</sup> Ed., Prentice Hall.
- Bruce Eckel. (2002). *Thinking in Java*, 3<sup>rd</sup> Ed. PHI.
- E. Balaguruswamy (2009). *Programming with Java*, 4<sup>th</sup> Ed. McGraw Hill.
- Paul Deitel, Harvey Deitel. (2011). *Java: How to Program*, 10<sup>th</sup> Ed. Prentice Hall,
- Bert Bates, Kathy Sierra. (2005). *Head First Java*, Orielly Media Inc. 2<sup>nd</sup> Ed.
- Eck, David J. (2009). *Introduction to Programming Using Java*, Create Space Independent Publishing Platform.
- Hubbard, John R. (2004). *Programming with JAVA*, Schaum's Series, 2<sup>nd</sup> Ed.

### PRACTICAL- Programming in JAVA Lab

**Total Time – 60 hours**

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBuffer class like setCharAt (setLength(), append(), insert(), concat() and equals()).
9. Write a program to create a —distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer.
10. Modify the —distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword

13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacci series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program —DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URL Connection using the open Connection() method and then use it examine the different components of the URL and content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet's window.
26. Write a program to get the URL/location of code (i.e. java code) and document (i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

## DC01BD-2C3 Environmental Science

**Theory**

**Total Timings – 30 hours**

### **Goals:**

1. Creating the awareness about environmental problems among students
2. Imparting basic knowledge about the environment and its allied problems.
3. Developing an attitude of concern for the environment.
4. Motivating students to participate in environment protection and environment improvement.

### **Unit 1**

Introduction to environmental studies • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development. (2 lectures)

Unit 2 : Ecosystems • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems : a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lectures)

### **Unit 3**

Natural Resources : Renewable and Non-renewable Resources • Land resources and land use change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). • Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies. (8 lectures)

### **Unit 4**

Biodiversity and Conservation • Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic 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. (8 lectures)

### **Unit 5**

Environmental Pollution • Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management : Control measures of urban and industrial waste. • Pollution case studies. (8 lectures)

### **Unit 6**

Environmental Policies & Practices • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture 2/2 • 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 Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. (7 lectures)

### **Unit 7**

Human Communities and the Environment • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. •

Disaster management : floods, earthquake, cyclones and landslides. • Environmental movements : Chipko, Silent valley, Bishnois 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). (6 lectures)

### Unit 8

Field work • 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. (Equal to 5 lectures)

### Suggested Reading

- Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
- Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge
- Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
- McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
- McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
- Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
- Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
- Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
- Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
- Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
- Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
- World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press

## DC01BD-2G1 Statistical Techniques With 'R

**Theory+Tutorial**

**Total Time – 90 hours**

### **Goal:**

- Select appropriate statistical techniques for summarizing and displaying data
- Analyze and draw inferences from data using appropriate statistical methods.
- Analyze the dispersion in the data and draw inference.
- Understand the concept of a frequency distribution for sample data, and be able to summarize the distribution by diagrams and statistics.
- Understand correlation and regression, and be able to make predictions and understand their limitations.

### **Course Objectives:**

The objective of this course is to frame real life problems in appropriate statistical terms in order use data to make better decisions. This also gives make sense of data along with the basics of regression analysis They will develop critical and integrative thinking in order to communicate the results of the analysis clearly in the context of the problem. This course will help to unambiguously articulate the conclusions and limitations of the analysis with a clear separation between data and judgment.

### **Unit 1**

**Classification, tabulation and graphical representation of data:** types of data, measurement of data, Classification of data, preparation of tables, stem and leaf display, presentation of data, frequency distribution, graphical representation.

**Measure of central tendency:** need, importance and Characteristics, Mean: Arithmetic mean, Geometric mean, Harmonic mean, Weighted mean, Combined mean, Median, Mode of grouped and ungrouped data, quartiles, merits and demerits.

### **Unit 2**

**Measure of Dispersion:** need, importance and properties, range, interquartile deviation, quartile deviation, mean deviation, variance, standard deviation, coefficient of variation, combined variance of grouped and ungrouped data, merits and demerits.

**Regression:** scatter diagram, Simple linear regression, regression line x on y and y on x, regression coefficients, method of least squares to fit a regression line, properties of regression coefficient, multiple regression (2 independent variables), applications.

### **Unit 3**

**Correlation:** graphical representation, correlation coefficient, correlation of bivariate data, relationship between correlation coefficient and regression coefficients, rank correlation, and problem of tied observations.

## Unit 4

**R Programming:** Introducing R, The need for R, Installing R, RStudio; Basic Objects – Vector, Matrix, Array, Lists, Data frames, Functions

**Managing Workspace :** R's working directory, Inspecting the environment, Modifying global options Managing the library of packages; **Basic Expressions:** Assignment expressions, Conditional expressions, Loop expressions

**Working with Strings:** Getting started with strings, Formatting date/time, Using regular expressions.

**Working with Data:** Reading and writing data, Visualizing data, Analyzing data

## Unit 5

**Inside R:** Understanding lazy evaluation, the copy-on-modify mechanism, lexical scoping, how an environment works; Metaprogramming -functional programming; Computing on language

**Data Manipulation :** Using built-in functions to manipulate data frames, Using SQL to query data frames via the sqldf package, Using data.table to manipulate data, Using dplyr pipelines to manipulate data frames, Using rlist to work with nested data structures; Profiling code, Boosting code performance

### Suggested Reading

- Thomas , Seemon, “Basic Statistics”, 2014, Narosa publishing house
- Rice , John A, “Mathematical Statistics and data Analysis”, 2014, Cengage learning India
- Sheldon M Ross, “Probability and Statistics for engineers and scientists” 4<sup>th</sup> edition, 2009, Elsevier Publications
- Douglas C. Montgomery & George C. Runger, “Applied Statistics and Probability for Engineers”, 3<sup>rd</sup> edition, 2003, John Wiley & Sons
- Albright, Zappe, Winston, “Data analysis, Optimization and Simulation Modeling”, 4<sup>th</sup> edition, 2011, Cengage learning
- Ken Black, “Applied Business Statistics making better business decision”, 7<sup>th</sup> edition, 2013, Wiley Publishers
- Sarab Boslaugh, Paul Andrew Watters, “Statistics in a nutshell”, 2008, Shroff publishers and distributors.
- Gupta , S; Kapoor V.K, “Fundamentals of mathematical Statistics”, 2012, Sulthan Chand and Sons.
- B L Agarwal, “Programmed Statistics”, 2<sup>nd</sup> edition, 2003, New Age International
- David Freedman, Robert Pisani, Roger Purves, “Statistics”, 4<sup>th</sup> edition, 2009, Viva books

## DC01BD-3C1 Database Management System

### THEORY

**Total Time - 60 hours**

#### Goal:

This course is developed along the database development life cycle, which will allow students to easily relate topics to one another along a logical path. The course concludes with an overview of transaction management and introduction to advanced and non-relational databases.

#### Course Objectives

1. The objective of the course is to enable students to understand and use a relational database system.
2. To introduce the students to Databases, Conceptual design using ERD, Functional dependencies and Normalization, Relational Algebra is covered in detail.
3. To learn how to design and create a good database and use various SQL operations.

#### Course Outcomes

1. Able to master the basic concepts and understand the applications of database systems.
2. Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.
3. Able to construct unary/binary/set/aggregate queries in Relational Algebra.
4. Understand and apply database normalization principles.
5. Able to construct SQL queries to perform CRUD operations on database. (Create, Retrieve, Update, Delete)
6. Understand principles of database transaction management, database recovery, security.

#### Unit 1

**Database Systems:** Introducing the database and DBMS, Files and File Systems, Problems with file System and advantages of Database Management systems.

**Data Models:** The importance of Data models, Data Model Basic Building Blocks, Business Rules, The evaluation of Data Models, Degree of Data Abstraction.

#### Unit 2

**The Relational Database Model:** A logical view of Data, Keys, Integrity Rules, Relational Set Operators, The Data Dictionary and the system catalog, Relationships within the Relational Database, Data Redundancy revisited, Indexes, Codd's relational database rules.

**Entity Relationship Model:** The ER Model, Developing ER Diagram,

#### Unit 3

**Normalization of database tables:** Database Tables and Normalization, The need for Normalization, The Normal forms and High level Normal Forms, denormalization.

#### Unit 4

#### SQL



**Introduction to SQL:** Data Definition Commands, Data Manipulation Commands, Select queries, Advanced Data Definition Commands, Advanced Select queries, Virtual Tables, Joining Database Tables.

**Advanced SQL:** Relational Set Operators, SQL Join Operators, Subqueries and correlated queries, SQL Functions, Oracle Sequences, and Procedural SQL.

## Unit 5

**Transaction Management and Concurrency Control:** What is transaction, Concurrency control, Concurrency control with locking Methods, Concurrency control with time stamping methods, concurrency control with optimistic methods, database recovery management.

### Suggested Reading

- Peter Rob, Carlos Coronel. (2007). *Database Systems Design, Implementation and Management*, 7<sup>th</sup> Ed., Thomson
- Elimasri / Navathe. (2007). *Fundamentals of Database Systems*, 5<sup>th</sup> Ed., Pearson Addison Wesley
- Raman A Mata – Toledo/Panline K Cushman. (2007). *Database Management Systems*, Schaum's Outlibe Series, Tata McGraw Hill.
- C.J.Date, A.Kannan, S.Swamynathan. (2006). *An Introduction to Database Systems*, 8<sup>th</sup> Ed., Pearson Education.
- Atul Kahate. (2006). *Introduction to Database Management Systems*, Pearson Education.

## PRACTICAL

**Total Time – 60 hours**

### Database Management Systems Lab

#### 1. Order Tracking Database

- The Order Tracking Database consists of the following defined six relation schemas.
- Employees(eno,ename,zip,hdate)
- Parts(pno,pname,qoh,price,level) (hint: qoh: quality on hand)
- Customers(cno,cname,street,zip,phone)
- Orders(ono,cno,eno,received date,shipped date) Odetails(ono,pno,qty)
- Zipcodes(zip,city)

#### Solve the following

1. Get all pairs of customer numbers for customers based on same zip code.
2. Get part numbers for parts that have been ordered by at least two different customers.
3. For each odetail row, get ono,pno,pname,qty and price values along with the total price for the item. (total price=price\*qty)
4. Get customer name and employee pairs such that the customer with name has placed an order through the employee
5. Get customer names living in fort dodge or liberal.
6. Get cname values of customers who have ordered a product with pno 10506.
7. Get pname values of parts with the lowest price. 8. Get cname values of customers who have placed at least one order through the employee with number 1000.
8. Get the cities in which customers or employees are located.
9. Get the total sales in dollars on all orders.
10. Get part name values that cost more than the average cost of all parts.
11. Get part names of parts ordered by at least two different Customers.
12. Get for each part get pno, pname and total sales

13. For each part, get pno,pname, total sales, whose total sales exceeds 1000
14. Get pno, part names of parts ordered by at least two different customers.
15. Get cname values of customers who have ordered parts from any one employee based in wichita or liberal.

## 2. Shipment database

An enterprise wishes to maintain the details about his suppliers and other corresponding details.

**For that it uses the following tables :**

- Table s(sid,sname,address)
- primary key : sid
- Table p(pid,pname,color)
- primary key : pid
- Table cat(sid,pid,cost)
- primary key : sid+pid
- reference key : sid references s.sid
- pid references p.pid

**Solve the following**

1. Find the pnames of parts for which there is some supplier
2. Find the snames of suppliers who supply every part.
3. Find the snames of suppliers who supply every red part.
4. Find the pnames of parts supplied by london supplier and by no one else
5. Find the sids of suppliers who charge more for some part other than the average cost of that part
6. Using group by with having clause get the part numbers for all the parts supplied by more than one supplier.
7. Get the names of the suppliers, who do not supply part p2.
8. Find the sids of suppliers who supply a red and a green part 9. Find the sids of suppliers who supply a red or a green part
9. Find the total amount has to pay for that supplier by part located from london

## 3. Employee Database

An enterprise wishes to maintain a database to automate its operations. Enterprise divided into two certain departments and each department consists of employees.

The following two tables

- describes the automation schemas
- Dept (deptno, dname, loc)

**Emp (empno,ename,job,mgr,hiredate,sal,comm,deptno)**

1. Create a view, which contain employee names and their manager names working in sales department.
2. Determine the names of employee, who earn more than their managers.
3. Determine the names of employees, who take highest salary in their departments.
4. Determine the employees, who located at the same place.
5. Determine the employees, whose total salary is like the minimum salary of any department.
6. Update the employee salary by 25%, whose experience is greater than 10 years.
7. Delete the employees, who completed 32 years of service.
8. Determine the minimum salary of an employee and his details, who join on the same date.
9. Determine the count of employees, who are taking commission and not taking Commission.

10. Determine the department does not contain any employees.
11. Find out the details of top 5 earner of company.
12. Display those managers name whose salary is more than average salary of his employees.
13. Display those employees who joined the company before 15th of the month.
14. Display the manager who is having maximum number of employees working under him.
15. Print a list of employees displaying 'less salary' if less than 1500 if exactly 1500 display as 'exact salary' and if greater than 1500 display 'more salary'?
16. Display those employees whose first 2 characters from hire date-last 2 characters of salary?
17. Display those employees whose 10% of salary is equal to the year of joining?
18. In which year did most people join the company? Display the year and number of employees.
19. Display the half of the enames in upper case and remaining lower case
20. Display ename, dname even if there no employees working in a particular department(use outer join).

#### 4. Pl/sql programs

1. Write a pl/sql program to check the given number is strong or not.
2. Write a pl/sql program to check the given string is palindrome or not.
3. Write a pl/sql program to swap two numbers without using third variable.
4. Write a pl/sql program to generate multiplication tables for 2,4,6
5. Write a pl/sql program to display sum of even numbers and sum of odd numbers in the given range.
6. Write a pl/sql program to check the given number is pollinndrome or not.
7. write a pl/sql procedure to prepare an electricity bill by using following table  
table used: elect  
name null? Type  
mno not null number(3)  
cname varchar2(20)  
cur\_read number(5)  
prev\_read number(5)  
no\_units number(5)  
amount number(8,2)  
ser\_tax number(8,2)  
net\_amt number(9,2)
8. Write a procedure to update the salary of employee, who belongs to certain department with a certain percentage of raise.

## DC01BD-3C2 Object Oriented Analysis

**Theory + Tutorial**

**Total Time – 90 hours**

### Goals:

1. Ability to analyze and model software specifications.
2. Ability to abstract object-based views for generic software systems.
3. Ability to deliver robust software components

### Objectives

1. To understand the Object-based view of Systems
2. To develop robust object-based models for Systems
3. To inculcate necessary skills to handle complexity in software design

### Unit 1

**The Object Model:** The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model.

**Classes and Objects:** The Nature of an Object – Relationship among Objects.

### Unit 2

**Classes and Object:** Nature of Class – Relationship Among classes – The Interplay of classes and Objects.

**Classification:** The importance of Proper Classification – identifying classes and objects – Key Abstractions and Mechanism.

### Unit 3

Introduction to C++ - Input and output statements in C++ - Declarations - control structures – Functions in C++.

### Unit 4

Classes and Objects – Constructors and Destructs – operators overloading –Type Conversion - Inheritance – Pointers and Arrays.

### Unit 5

Memory Management Operators - Polymorphism – Virtual functions – Files –Exception handling - sting handling – Templates.

### Suggested Reading

- ✓ Grady Booch, "**Object Oriented Analysis and Design with Applications**", Second Edition, Pearson Education.
- ✓ Ashok N. Kamthane, "**Object Oriented Programming with ANSI & Turbo C++**", First Indian Print -2003, Pearson Education.
- ✓ Samanta "**Object Oriented Programming with C++ and Java**", PHI.
- ✓ Balagurusamy "**Object Oriented Programming with C++**", TMCH, Second Edition, 2003.
- ✓ Debasingh Jana, "**C++ and Object Oriented Progr amming Paradigm**", 2003, PHI.
- ✓ M.P. Bhawe and S.A. Patekar, "**Object Oriented Programming with C++**", 2004, Pearson Education.

## DC01BD-3C3 Operating System and Computer Networks

**Theory+ Practical**

**Total Timings – 60 hours**

### **Goals:**

The course focuses on basic and essential topics in data structures, including array-based lists, linked lists, skip lists, hash tables, recursion, binary trees, scapegoat trees, red–black trees, heaps, sorting algorithms, graphs, and binary tree. Specific objectives are,

1. Ability to write programs using array-based lists; linked lists; skip lists; using binary trees and variations.
2. Ability to write code for hash tables, and compare and contrast various collision detection and avoidance techniques.
3. Ability to apply heaps to implement priority queues
4. Ability to implement data structures for graphs and approaches for searching graphs using breadth-first, depth-first, best-first search, etc.
5. Ability to analyze binary tree.

### **Course Objectives:**

1. To demonstrate skills in tracing, analyzing, and designing recursive algorithms and recursive methods.
2. To explain programs that use scapegoat trees and also programs that use red–black trees.
3. To analyze and implement different types of sorting algorithms.

### **Unit 1**

**Introduction:** Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems, Operating System Structures, Components & Services, System calls, System programs, Virtual machines. Process Management: Process Concept, Process Scheduling, Co – Operating process, Threads, Inter process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling, Real time Scheduling, Algorithm evolution.

### **Unit 2**

**Process Synchronization and deadlocks:** The Critical Section Problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors, Dead locks – system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock, Combined approach to deadlock handling.

### **Unit 3**

**Memory Management:** Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging in Mastics and Intel 386, Virtual memory-Demand paging and it's performance, Page replacement algorithms, Allocation of frames, thrashing, page size and other considerations. Demand Segmentation.

### **Unit 4**

**File management (Systems, Secondary Storage Structure:** File Concepts, Access methods, Directory Structure, Protection and consistency, File system structure, Allocation methods, Free space management, Directory Implementation, Efficiency and Performance, Recovery. Disk Management (Structure, Disk Scheduling Methods): Disk Structure & Scheduling methods, Disk management, Swap – Space management.

## Unit 5

**Protection and Security:** Goals of protection, Domain Protection, Access matrix, Security Problem, Authentication, One-time password, program threats, System threads.  
Case Study of Windows and Linux Operating System.

### Suggested Reading:

- Abraham Silberschatz and Peter Baer Galvin. (2012). *Operating System Concepts*, 7<sup>th</sup> Ed., Pearson.
- H.M.Deitel. (2003). *Operating Systems*, 3<sup>rd</sup> Ed. Pearson Learning Solutions.
- William Stallings. (2010). *Operating Systems*, 6<sup>th</sup> Ed., Pearson Education.
- Stuart. (2008). *Operating systems: Principles, Design and Implementation*, 1<sup>st</sup> Ed. Cengage Learning India

## Computer Network

### Unit 1

**Network Architecture:** Network architecture – layers – Physical links – Channel access on links – Hybrid multiple access techniques - Issues in the data link layer - Framing – Error correction and detection – Link-level Flow Control.

### Unit 2

**Connections:** Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges and switches.

### Unit 3

**Networks:** Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP – DHCP – ICMP – Queueing discipline – Routing algorithms – RIP – OSPF – Subnetting – CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer.

### Unit 4

**Retransmission:** UDP – TCP – Adaptive Flow Control – Adaptive Retransmission - Congestion control – Congestion avoidance – QoS.

### Unit 5

**HTTP:** Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP – Security – PGP – SSH.

### Suggested Reading:

1. Andrew S. Tanenbaum. (2003). *Computer Networks*, 4<sup>th</sup> Ed.
2. Trivedi, Bhushan. (2012). *Computer Networks*. Oxford University Press
3. James F. Kuross, Keith W. Ross. (2004). *Computer Networking, A Top-Down Approach Featuring the Internet*, 3<sup>rd</sup> Ed. Addison Wesley
4. Nader F. Mir. (2007). *Computer and Communication Networks*, Pearson Education.
5. Comer. (2003). *Computer Networks and Internets with Internet Applications*, 4<sup>th</sup> Ed. Pearson Education.
6. Stallings, William. (2000). *Data and Computer Communication*. 6<sup>th</sup> Ed. Pearson.

## **PRACTICAL**

**Total Time – 60 hours**

### **Computer Networks lab**

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call).
7. Implementation of Subnetting.
8. Applications using TCP Sockets like : a. Echo client and echo server b. Chat c. File Transfer
9. Applications using TCP and UDP Sockets like DNS, SNMP and File Transfer.
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.

## DC01BD-3S1 Research Methodology

### Theory

**Total Timings - 30 hours**

#### Goal:

Research Methodology helps the students to accumulate knowledge which are essential for gathering, analyzing and interpretation of the problems confronted by humanity. This paper introduces the nature of Social and Business research, and provides the techniques of research, identification of problem, research design, data collection, sampling, hypothesis, processing, and interpretation of data and preparation of reports. As a prerequisite, students should be having a basic knowledge about concepts relating to research, basic statistics and business.

#### Course Outcome

- ✓ Provide an overview of the research process
- ✓ To familiarize the methods and techniques of research
- ✓ State clearly their research problem and associated research questions arising, including both descriptive and either explanatory or exploratory questions.
- ✓ Conduct a literature review of the concepts comprising the research questions
- ✓ Set out the main elements of a potential research instrument for testing the hypotheses,
- ✓ Distinguish between quantitative and qualitative approaches and methods
- ✓ To enhance the student in designing research report

**Pedagogy:** Combination of lectures, assignments, exercise and group discussion.

#### Unit 1

**Nature of Social and Business Research:** Meaning and definition of research, Criteria of good research, social research-objectives, assumptions, deductive and inductive methods, significance and difficulties of Social research. Business research- Research and business decisions.

#### Unit 2

**Methods and Techniques of Research:** Classification of research-According to the intent- Pure Research, Applied Research, Exploratory Research, Descriptive Study, Diagnostic Study, Evaluation Studies, and Action Research. According to the method- Experimental Research, Analytical Study, and Historical Research. Inter Disciplinary Research and its essentials.

#### Unit 3

**Research Problem and Research Design:** Research Problem: Steps involved for selection of a topic for research study, components of research problem, Definition of Problem, Evaluation of Problem, review of relevant literature, sources of literature Note Taking. Testing of Hypothesis, Errors in Hypothesis, Research Design: - Meaning, definition, Classification of Research Designs. Importance of Research Plan, Contents of a Research Plan.



#### **Unit 4**

**Sampling and Sample Design:** Meaning of Sample, purpose of Sampling, Sampling Technique – Random Sampling and Non-random sampling, Errors in Sample Surveys – Sampling Errors and Non Sampling Errors.

#### **Unit 5**

**Methods and Tools for Data collection:** Methods of Data Collection: Meaning and Importance of data, Sources of data – Primary Sources and Secondary Sources, Methods of collection of Primary and Secondary data. Tools or instruments of data collection: Observation schedule, Interview guide, Interview schedule, Mailed questionnaire, Rating scale, Check list, Opinionated, Document Schedule. Types of Questions–open ended/close ended, Measurement scale–Meaning and types.

#### **Unit 6**

**Processing, Analysis and Interpretations of Data and Report writing:** Steps in data processing, editing, coding, classification, transcription, analysis of data, interpretation. Use of Excel in Data Entry & Analysis- Variable types- Frequency tables – Various Kinds of Charts and Diagrams Used and their Significance.

**Report Writing:** Introduction, types of report, planning of report-writing, format of research report. Documentation: Foot notes and Bibliography, briefing and evaluation of report-writing.

#### **Suggested Reading**

- Krishnaswami, O.R (2012).*Research Methodology. Mumbai: Himalaya publishing House.*
- Bhandarkar, W. T. (2006).*Methodology and Techniques of Social Research.*Mumbai: HimalayaPublishing House.
- Krishnaswami, O. (2012).*Research Methodology.*Mumbai: Himalaya publishing House.
- C.N Kothari.*Research Methodology/3<sup>rd</sup>edn: New Age International Pvt Ltd; New Delhi*
- Pannerselvam.R. (2006).*Research Methodology. New Delhi: Prentice Hall of India.*
- Trochim, M.K. (2009).*Research Methods.*New Delhi: Sultan Chand.

## DC01BD-3G1 Web Application Developments

**Theory+ Practical**

**Total Timings - 60 hours**

### **Goal:**

At the end of the course, the

- Students will be able to develop websites and web based projects.
- Students can be employed on entry-level jobs of PHP based web development in software industry.
- Students can develop interactive and dynamic website.

### **Course Objectives**

The objectives of this course are to make the students to:

- To produce dynamic, animated, interactive and database driven web sites to prepare students for internet marketing and web site administration.
- Students will learn different languages like HTML5, CSS, JavaScript and PHP (Server Side Programming); Students will work with different technologies and software components like web browsers, web servers (Apache) and database connectivity's.

### **Unit 1**

**HTML 5:** Difference between HTML 4 & 5, Page Structure of HTML5. Section Tag & Article Tag; Adding figure and sidebar; Outlining in HTML5; using audio Element; Video Tag Attributes. HTML5 Forms Tags, search, tel, url and email; date/time input types, coloumnumber, range, min, max, and step attributes. Form Attributes, autocomplete, novalidate. Form Field Attributes, required, placeholder.

HTML5 Canvas; Drawing Lines; Multiple Sub-Paths; The Path Drawing Process. The fill() Method; Color and Transparency; Rectangles. Circles, Arcs and Curves.

### **Unit 2**

**CSS:** Introduction to CSS, CSS Rules, Pseudo classes and pseudo elements, Selectors, Precedence of Selectors; Cascading; Creating an Embedded Style Sheet; Creating an External Style Sheet; Adding Inline Styles; Using CSS box model for spacing, borders, and backgrounds; Using CSS for page layout; Dealing with fonts, text, images and hyperlinks; Using Lists as Hierarchical Navigation. Styling Forms with CSS.

Drawback of CSS; Difference between SASS and LESS; Installation of LESS; Using LESS, Variables, Mixins, Cascading + Nesting, &combinatory, Operations, Comments, @import, String interpolation, Escaping, Pre-compile, Post-compile , LESS Elements.

### **Unit 3**

**jQuery UI :**Overview of jQuery; Using jQuery Selectors and Filters; Selecting Single and Multiple Elements. Operating on Wrapped Sets; Method Chaining; Accessing Attributes of an Element; Adding and Removing Elements; Setting up JQueryUI; JQueryUI Interactions, JQueryUI Widgets, JQueryUI Effects.

## Unit 4

**PHP Basics :** Introduction to PHP; Embedding PHP code inside HTML; Working with Types and operators; Integer division, Generating Random numbers; Comparing values with the spaceship operator; Condition and Looping statements; Arrays, Numeric Associative and Multi-dimensional arrays; Strings and String functions; Regular Expressions; Date and Time function; Mathematical functions; User-Defined Functions; Return type declarations with compound Types; Scalar Type Hinting; Scalar Parameter and Return Type declarations; Working with web forms; PHP POST & GET form elements; Validating form data; Understanding magic quotes; Setting default values in forms; Handling Errors, Throwing and Catching Exceptions. Logging exceptions.

## Unit 5

**PHP Intermediate:** Classes and Objects Constructors and Destructors Access Specifiers, Static and final modifiers Inheritance and its types Polymorphism, Abstract and Final classes. Anonymous Classes, Generator Return expressions, Generator Delegation. Using MySQL; Database Basics, Configuring PHP for Database Support, Managing Database Connections, PHP's Database & SQL APIs, Performing Queries, Processing Result Sets, PDO. PHP cookie handling; PHP session handling; Reading & writing; files with PHP; Processing uploaded files; Retrieving uploaded files; Mail functions

## Suggested Reading

- Kogent Learning, “HTML 5 Black Book: Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and jQuery”, 1<sup>st</sup> Edition, 2011, Tata McGraw Hill Publishers .
- Christopher Murphey, R Clark, “Beginning HTML 5 and CSS 3”, 1<sup>st</sup> Ed, 2015, Wiley Apress.
- M Rochkind, “Expert PHP and MySQL: Application Design and Development”, 2013, Apress
- Likas White, “Practical Laravel 5”, 1<sup>st</sup> Edition, 2014, Wiley Apress
- Simon Sarris, “HTML5 Unleashed”, 1<sup>st</sup> Edition, 2013, Sams Publishing.
- Piotr Sikora, “Professional CSS3”, 1<sup>st</sup> Edition, 2014, Packt Publishing Limited.
- Alex Libby, “Instant LESS CSS Preprocessor How-to”, 1<sup>st</sup> Ed, 2015, Packt Publishing Limited.
- Eric Sarrion, “jQuery Ui”, 2<sup>nd</sup> Edition, 2013, Orelly Publishers
- Joel Murach, Mike Murach, “Murach's PHP and MySQL”, 2<sup>nd</sup> Edition, 2012, Wiley India
- Adam Freeman , “Pro jQuery”, 1<sup>st</sup> Edition, 2013, Wiley Apress International.
- Steve Prettyman , “Learn PHP 7. Object-Oriented Modular Programming using HTML5, CSS3, JavaScript, XML, JSON, and MySQL”, 2<sup>nd</sup> Edition, 2014, Wiley Apress.
- Bartoz Porebski, “Building PHP Applications”, 1<sup>st</sup> Edition, 2014, Wiley Wrox Publishers
- Andrew Curisao, “Expert PHP and My SQL”, 1<sup>st</sup> Edition, 2014, Wiley Wrox Publications

## PRACTICALS

Total Timings- 60 hours

### A. HTML

1. Create a table in HTML with Person's Details
2. Create a registration form using HTML form input elements viz. textbox, text area, radio button and drop down menu, check box, submit, file and reset button. Field should contain name, address, birth-date, qualification, email, phone number, gender, comments, attach photo etc. Use HTML Form elements wherever required. Align all elements using table.
3. Create a HTML programs using frames. Three frames displaying three different HTML files.
  - i. Frame 01 – contain examples of ordered as well as unordered list.
  - ii. Frame 02 – contain examples of text formatting tags i.e. <b>, <i>, <u>, <h1>--<h6>, <p>, <sup> and <sub>.
  - iii. Frame 03 – contain example of 3 by 4 table with data.
  - iv. Create a hyperlink in Frame 01 that opens in Frame 03

### B. CSS

1. Create a horizontal navigation bar in DIV using external CSS which contain home, about, gallery, enquiry, contacts menus. Also create the same bar in vertical alignment in another DIV in same page.
2. Create a following layout using CSS and display it in html file with proper border, background color, margin, border and padding.

### C. PHP

1. Create a PHP program in which two values submitted using form and calculate its addition, subtraction, multiplication, modulation, average and division on the same page. Find the greatest number between them and square of each of them using PHP function.
2. Write following program in PHP:
  - i. Validating given email address
  - ii. Change background color based on hour of a day.
  - iii. Print Fibonacci Series.

### D. JavaScript

1. Write a Java script program to create a simple calculator.
2. Write following Java script program:
  - i. Create form validation program that checks the empty values from that form and alertback using alert function. Use at least 5 components.
  - ii. Display a live clock in Java script.

### E. PHP MYSQL Admin

1. Create feedback form in PHP which contains first name, last name, address, email, comment and mobile number and store that information in database. Also create a page which displays submitted feedbacks in tabular form.
2. Create a login form using session handling in PHP. After successful login display name, address and other details in tabular format of logged user. Create 5 users. Also create a 'Logout' option. Store the data of user, login and password in the database.
3. Create a simple address book in PHP using MySQL database which contains Adding new person with address (name, phone number, email, permanent address and temporary address etc..), updating their address, deleting him from record and view all records in table.

## **F. Java Servlets**

1. Create two textboxes on the HTML page named login and password. After clicking on the 'login' button the servlet will be displayed. It will show 'login successful' upon correct password else 'authentication failure' will be displayed. Make the use of HTTP Servlet or Generic Servlet.
2. Write a program to demonstrate the use of servlet request and response as well as doGet ( ) and doPost( ) methods. (The subject teacher should provide the appropriate problem statement for this).

## DC01BD-4C1 Software Engineering

**Theory + Tutorial**

**Total Timings - 90 hours**

### **Goals:**

Upon Completion of this course, students should be able to:

- Plan and deliver an effective software engineering process, based on development lifecycle models.
- Employ group working skills including general organization, planning and time management and negotiation.
- Capture, document and analyse requirements.
- Translate a requirements specification into an implementable design, a structured and organised process.
- Make effective use of UML, along with design strategies such as defining a software architecture, separation of concerns and design patterns.
- Formulate a testing strategy for a software system, employing techniques such as unit testing, test driven development and functional testing.
- Evaluate the quality of the requirements, analysis and design work done during the module.

### **Course Objectives:**

Computing systems become numerous, more complex and deeply embedded. This calls for systematic approaches to software development and maintenance. Software engineering meets this requirement. The student shall be able to take up a software projects and plan, develop and estimate its cost.

### **Unit 1**

**Introduction** Software, Software Engineering: Definition; Phases in Software Engineering, Key Challenges in Software Engineering.

**Software Process Life Cycle:** Software Process, Project and Product; Process Assessment; Software Life cycle models; Selection criteria of Software Process Models; Organization Process.

### **Unit 2**

**Software Requirements:** Software Requirement, Feasibility Study, Requirements Elicitation; Requirement Analysis; Analysis Patterns; Requirements Specification; Requirements Validation; Requirements Management; Requirements Engineering Tools;

**Software Design:** Basics of Software Design; Data Design; Architectural Design; Component-Level design; User Interface Design; Pattern-Based Software Design; Developing a Collaborative Design; Software Design Notation; Software Design Reviews, Software Design Documentation; Case Studies

### Unit 3

**Software Coding:** Features of a Software code; Coding Guidelines, Coding Methodology; Programming Practices, Code Verification Techniques, Coding Tools, Code Documentation

**Software Testing:** Software Testing Basics, Test Plan, Test Case Design, Software Testing Strategies, V Model of Software Testing, Levels of Software Testing; Testing Techniques; Object-oriented Testing; Software Testing Tools; Debugging; Software Test Report(STR), Case Studies

### Unit 4

**Software Maintenance:** Software Maintenance; Types of Software Maintenance; Software Maintenance Life Cycle; Software Maintenance Models; Techniques for Maintenance; Tools for Software Maintenance; Technology Change Management (TCM); Software Maintenance Documentation

**Software Quality:** Quality Concepts; Software Quality Assurance Group; SQA Activities; Software Reviews; Evaluation Quality; CMM; TQM; Software Reliability.

### Unit 5

**Software Metrics:** Software Measurement; Software Metrics; Designing Software Metrics; Classification of Software Metrics; Process Metrics; Product Metrics; Project Metrics; Measuring Software Quality; Object-Oriented Metrics

**Software Planning & Scheduling:** Project Planning; Project Scheduling; Project staffing; People Capability Maturity Model; Risk Management

### Suggested Reading

- R. S. Pressman, “Software Engineering – A practitioner’s approach”, 7<sup>th</sup> Ed, 2012, McGraw Hill Int. Ed.,.
- Jawdekar, “Software Engineering”, 3<sup>rd</sup> Edition, 2011, Tata McGraw-Hill Publications.
- K.K. Aggarwal & Yogesh Singh, “Software Engineering”, 3<sup>rd</sup> Edition, New Age International
- Kelkar, “Software Engineering”, 1<sup>st</sup> Edition, 2010, Prentice Hall of India Ltd
- I. Sommerville, “Software Engineering ”, 10<sup>th</sup> Edition, 2013, Pearson.
- Ali Behforooz, F J Hudson, “Software Engineering Fundamentals”, 1<sup>st</sup> Ed, 2008, Oxford University Press.
- James Peter, W Pedrycz, “Software Engineering”, 4<sup>th</sup> Edition, 2011, Wiley India
- R. Fairley, “Software Engineering Concepts”, 1<sup>st</sup> Ed, 2009, Tata McGraw Hill,
- Stephen R. Schach, “Classical & Object Oriented Software Engineering”, 2<sup>nd</sup> Ed, 2007, Wiley
- Rohith Kurana, “Software Engineering Principles and Practices”, 3<sup>rd</sup> Edition, 2011, Vikas Publishers

## DC01BD-4C2 Mobile Application Development Using Android

### Theory + Tutorial

**Total Timings-90hours**

#### Goal:

- To exploit the many capabilities of modern mobile devices to produce creative solutions to everyday challenges.
- Independently manage all phases of mobile project development
- Develop mobile applications using modern mobile development tools for either the Android.
- Develop applications that effectively combine mobile device capabilities such as communication, computing, and particularly sensing.

#### Course Objective: The learning objectives are:

- To define mobile computing and the types of mobile devices.
- To understand the development environments, Architectures and programming paradigms of Windows, Android and iOS devices. & To understand user interface design considerations.
- To develop an understanding of how to design, implement, and debug/test applications for mobile devices.

#### Unit 1

**Overview of Mobile Devices:** Mobile devices vs. desktop devices - ARM and Intel architectures Development environments; XCode EclipseVisual Studio- Native vs. Web Applications.Comparing and Contrasting architectures of – Android, iOS and Windows - Underlying OS (Darwin vs. Linux vs. Win 8) - Kernel structure and native level programming - Runtime (Objective-C vs. Dalvik vs. WinRT)

#### Unit 2

**Android:** An Open Platform for Mobile Development: Introduction to Android - Architecture - Features of Android SDK - Introducing the Development Framework, Developing for Android-**Android Development Tools-** The Android Virtual Device Manager - Android SDK Manager - The Android Emulator - The Dalvik Debug Monitor Service - The Android Debug Bridge. Installing and Configuring Android SDK, ADT and AVD - Android Software Stack, Dalvik Virtual Machine.

#### Unit 3

**Creating Android Applications:** Working of Android Application: Android Application Life Cycle; Building User Interfaces - Introducing Activities, Activity Life Cycle, Various Layouts, Fragments, and Adapters. Intents, Intent Filter and Broadcast Receivers; Controls, Dialogs.

**Toasts and Notifications:** Using Basic Views , Picker Views, List Views and Specialized Fragments ; Displaying Pictures and Menus With Views; Adding Interactivity and Handling UI events like Click, Key, Touch and Multi Touch



#### **Unit 4**

Saving Application Data: Creating, Saving and Retrieving Shared Preferences; Introducing the Preference Framework and the Preference Activity; Including Static Files as Resources; Working with the File System.

Data Access in Android: Introducing Android Databases; Introducing SQLite; Content Values and Cursors; Working with SQLite Databases; Creating and Using Content Providers; Using Native Android Content Providers.

#### **Unit 5**

Advanced Android: Introducing Services, Using Background Threads, Using Alarms; Controlling Device Vibration; Introducing Android Text-to-Speech; Using Sensors and the Sensor Manager; Using Accelerometer, Compass and GPS; Audio, Video and Using the Camera; Using Telephony and SMS.

#### **Suggested Reading:**

- B M Harwani, "Android programming Unleashed", 1<sup>st</sup> Edition, 2013, Pearson Sams Series
- Reto Meirer, "Professional Android 4 Application Development", 1<sup>st</sup> Ed, 2012, Wiley Wrox
- MacLean, Kanakala Komatineni, "Expert Android", 1<sup>st</sup> Ed, 2013, Wiley Apress
- Wallace B. McClure Nathan Blevins John J. Croft Iv Jonathan Dick Chris Hardy, "Professional Android Programming With Mono For Android And .Net/C# ", 1<sup>st</sup> Ed, 2012, Wiley Wrox
- Jef Fiesen, "Learn Java For Android Development", 1<sup>st</sup> Ed, 2010, Wiley Apress
- James C, "Android Application Development for Java Programmers", 1<sup>st</sup> Ed, 2012, Cengage
- Ian f Darwin, "Android CookBook", 1<sup>st</sup> Edition, 2012, O'Reilly Publishers.
- J F Demarizio, "Android: A Programmers Guide", 2010, Tata McGraw Hill
- Chris Haseman, "Android Essentials", 1<sup>st</sup> Ed, 2012, Wiley Apress
- Zigurd Mednieks, Rick Rogers, L John, Blake Meike, "Android Application development", O'Reilly
- Wallace Jackson, "Android Apps for Absolute Beginners", 1<sup>st</sup> Ed, 2011, Wiley Apress
- Milette Stroud, "Professional Android Sensor Programming", 1<sup>st</sup> Ed, 2012, Wiley Wrox
- Daniel sauter, "Rapid Android Application Development", 1<sup>st</sup> Ed, 2013, Pragmatic Publishers.

## DC01BD-4C3 Data Warehousing and Mining

**Theory + Tutorial**

**Total Timings -90 hours**

### **Goal:**

This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for pre-processing of data. Modeling and design of data warehouses. Algorithms for classification, clustering and association rule analysis. Practical use of software for data analysis.

1. Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Apply pre-processing statistical methods for any given raw data
3. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques
5. Select and apply proper data mining algorithms to build analytical applications.
6. Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate the knowledge discovery.

### **Course Objectives**

1. To understand data mining principles and techniques: Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors.
2. To develop and apply critical thinking, problem-solving, and decision-making skills.

### **Unit 1**

**Introduction:** Introduction to Data Mining, Fundamentals of data mining, data mining functionalities, data and attribute types, statistical description of data.

**Data Pre-processing:** Data cleaning, data integration, data reduction, data transformation and data discretization.

### **Unit 2**

#### **Data Warehousing**

Basic concepts, data ware house modelling data cube and OLAP, data warehouse design and implementation.

### **Unit 3**

#### **Data Mining**

Mining Frequent Patterns and Associations: Basic methods, frequent Item set mining methods any two algorithms, pattern evaluation methods.

### **Unit 4**

#### **Classification**

Basic concepts, decision tree induction, Bayes classification, any two advanced methods, model evaluation.

## **Unit 5**

### **Cluster Analysis**

Basic concepts, clustering structures, major clustering approaches, partitioning methods, hierarchical methods, density based methods, the expectation maximization method, cluster based outlier detection  
Essential Reading.

### **Suggested Reading**

- Vikram Pudi, P.Radhakrishna. (2002). *Data Mining*. Oxford University Press
- Reema Thareja. (2010). *Data Warehousing*. Oxford University Press
- I.J. Han , M. Kamber and J. Pei. (2011). *Data Mining: Concepts and Techniques*, 3<sup>rd</sup> Ed. Morgan Kaufmann.
- G.K.Gupta. (2001). *Introduction to Data Mining*, PHI

## DC01BD-4S1 Entrepreneurship

**Theory**

**Total Time - 30hours**

### **Goal:**

This course describes entrepreneurship as a process of economic or social value creation, rather than the single event of opening a business. Reflecting recent research, the course focuses on opportunity recognition, assembly of the financial and human resources needed to develop the idea, and launching the new venture.

### **Course Objectives.**

Students should be able

1. to gain knowledge of the context, concepts and process of entrepreneurship
2. to be better able to conceive and develop entrepreneurial opportunities
3. to be able to determine the feasibility of a new business concept
4. to develop familiarity with business plans

### **Unit 1**

**Introduction:** Meaning, elements, determinants and importance of entrepreneurship and creative behaviour; Entrepreneurship and creative response to the society' problems and at work; Dimensions of entrepreneurship: intrapreneurship, technopreneurship, cultural entrepreneurship, international entrepreneurship, Entrepreneurship, ecopreneurship and social entrepreneurship

### **Unit 2**

**Entrepreneurship and Micro, Small and Medium Enterprises:** Concept of business groups and role of business houses and family business in India; The contemporary role models in Indian business: their values, business philosophy and behavioural orientations; Conflict in family business and its resolution

### **Unit 3**

Public and private system of stimulation, support and sustainability of entrepreneurship. Requirement, availability and access to finance, marketing assistance, technology, and industrial accommodation, Role of industries/entrepreneur's associations and self-help groups, The concept, role and functions of business incubators, angel investors, venture capital and private equity fund.

### **Unit 4**

**Sources of business ideas and tests of feasibility:** Significance of writing the business plan/ project proposal; Contents of business plan/ project proposal; Designing business processes, location, layout, operation, planning & control; preparation of project report (various aspects of the project report such as size of investment, nature of product, market potential may be covered); Project submission/ presentation and appraisal thereof by external agencies, such as financial/non-financial institutions.

## Unit 5

**Mobilising Resources:** Mobilising resources for start-up. Accommodation and utilities; Preliminary contracts with the vendors, suppliers, bankers, principal customers; Contract management: Basic start-up problems.

### Suggested Reading

- ✓ Kuratko and Rao, *Entrepreneurship: A South Asian Perspective*, Cengage Learning.
- ✓ Robert Hisrich, Michael Peters, Dean Shepherd, *Entrepreneurship*, McGraw-Hill Education
- ✓ Desai, Vasant. *Dynamics of Entrepreneurial Development and Management*. Mumbai, Himalaya Publishing House.
- ✓ Dollinger, Mare J. *Entrepreneurship: Strategies and Resources*. Illinois, Irwin.
- ✓ Holt, David H. *Entrepreneurship: New Venture Creation*. Prentice-Hall of India, New Delhi.
- ✓ Plsek, Paul E. *Creativity, Innovation and Quality*. (Eastern Economic Edition), New Delhi: Prentice-Hall of India. ISBN-81-203-1690-8.
- ✓ Singh, Nagendra P. *Emerging Trends in Entrepreneurship Development*. New Delhi: ASEED.
- ✓ S.S Khanka, *Entrepreneurial Development*, S. Chand & Co, Delhi.
- ✓ K Ramachandran, *Entrepreneurship Development*, McGraw-Hill Education
- ✓ SIDBI Reports on Small Scale Industries Sector.
- ✓ Dr. G.K. Varshney, *Fundamentals of Entrepreneurship*, Sahitya Bhawan Publications.

## DC01BD-4G1 Mini Projects

### Project

**Total Timings - 12 hours**

The student shall work for 80 hours in industry under the guidance of a faculty member of his/her department on a particular topic agreed mutually by them which would be called as a project. A report has to be submitted which shall be assessed followed by a viva voce examination. The student would also have to make a presentation before submitting the report on the completion of the project. The total number of hours for the project submission, presentation and viva is ten hours.

Si. No.	Details	Hours
1.	Working on a project	80
2.	Report, Presentation, Viva	10
	Total	90

## DC01BD-5C1 Foundation of Big Data System

**Theory + Tutorial**

**Total Time - 90 hours**

### **Goal**

**This course helps to understand the basic concepts of Big Data.**

1. To gain knowledge about various search methods and visualization techniques.
2. Ability to use various techniques for mining data stream
3. Ability to use programming tools PIG & HIVE in Hadoop ecosystem.

### **Objective**

1. To learn to analyze the big data using intelligent techniques.
2. To understand the applications using Map Reduce Concepts.
3. To introduce programming tools PIG & HIVE in Hadoop ecosystem.

### **Unit 1**

**Introduction to big data:** Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

### **Unit 2**

**Mining data streams:** Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

### **Unit 3**

**Hadoop:** History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment. Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams.

### **Unit 4**

**Analytics:** Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

## Suggested Reading:

- Michael Berthold, David J. Hand. (2007). *Intelligent Data Analysis*, Springer.
- Tom White. (2012). *Hadoop: The Definitive Guide*, 3<sup>rd</sup> Ed. O'reilly Media.
- Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos. *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, McGraw Hill Publishing.
- Anand Rajaraman and Jeffrey David Ullman. (2012). *Mining of Massive Datasets*, CUP.
- Bill Franks. (2012). *Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics*, John Wiley & sons.
- Glenn J. Myatt. (2007). *Making Sense of Data*, John Wiley & Sons.
- Pete Warden. (2011). *Big Data Glossary*, O'Reilly.
- Jiawei Han, Micheline Kamber. (2008). "Data Mining Concepts and Techniques", 2<sup>nd</sup> Edition, Elsevier, Reprinted 2008.
- Da Ruan, Guoqing Chen, Etienne E.Kerre, Geert Wets. (2007). *Intelligent Data Mining*, Springer.
- Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan. (2012). *Harness the Power of Big Data The IBM Big Data Platform*, Tata McGraw Hill Publications.
- Arshdeep Bahga, Vijay Madisetti. (2016). *Big Data Science & Analytics: A Hands On Approach*, VPT.
- Bart Baesens. (2014). *Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)*, John Wiley & Sons.



## DC01BD-5C2 Foundation of Data Analytics

**Theory + Tutorial**

**Total Timings - 90 hours**

### **Goal:**

This course is primarily designed for undergraduate students who plan to study advanced topics in modern data analytics, including machine learning, data mining, artificial intelligence and visualization.

1. To gain knowledge of optimizing business decisions and creating competitive advantage with Data analytics
2. To explore the fundamental concepts of big data analytics.

### **Objective**

**To explore** several fundamental topics in computational data analysis, including background knowledge of probability and linear algebra, linear regression, dimension reduction, gradient descent, clustering and classification.

### **Unit 1**

**Introduction:** Introduction to Analytics, Probability Review: sample space, random variables, independence, PDFs, CDFs, expectation, variance, joint and marginal distributions; Bayes Rule: Bayesian reasoning;

### **Unit 2**

**Convergence and Regression:** Convergence: central limit theorem, probably approximately correct; Linear Algebra Review: vectors, matrices, multiplication, norms, linear independence, rank, inverse, orthogonality, numpy; Regression: multiple regression, linear regression, polynomial regression, overfitting and cross-validation;

### **Unit 3**

**Gradient Descent:** Gradient Descent: functions, convexity, minimum, maximum, gradients, gradient descent, stochastic gradient descent, fitting a model to data; Dimension Deduction: SVD, rank-k approximation, eigenvalues, eigenvectors, power method, centering, PCA, M\Multidimensional Scaling;

### **Unit 4**

**Clustering:** Voronoi diagrams, k-means, EM, mixture of Gaussian, mean-shift; Classification: linear prediction, Perceptron algorithm, kernels and SVM, neural nets.

### **Suggested Reading**

- Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, (2014). *Practical Data Science Cookbook*, Packt Publishing Ltd.,
- Nathan Yau. (2011). *Visualize This: The FlowingData Guide to Design, Visualization, and Statistics*. Wiley.
- Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, (2015). *Professional Hadoop Solutions*, Wiley.

## DC01BD-5S1 CLOUD COMPUTING

**Theory**

**Total Timings - 30 hours**

**Goal:**

The primary learning outcomes of this course are five-fold. Students will be able to:

- To understand the principles of cloud computing
- To learn about the various cloud deployment options
- To learn the cloud computing paradigms
- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply fundamental concepts in cloud infrastructures to understand the trade-offs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacentres to build and deploy cloud applications that are resilient, elastic and cost-efficient.
- Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
- Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

**Objective:**

This course introduces cloud services, cloud management, cloud virtualization technologies

- To understand cloud services and solutions
- To know about cloud virtualization technologies and cloud management
- To understand the relevance of Cloud, SOA and benchmarks

**Unit 1**

**Introduction:** Introduction, Essentials, Benefits, Business and IT Perspective, Cloud and Virtualization, Cloud Services Requirements, Cloud and Dynamic Infrastructure, Cloud Computing Characteristics, Cloud Adoption.

**Cloud Models:** Cloud Characteristics, Measured Service, Cloud Models, Security in a Public Cloud, Public versus Private Clouds, Cloud Infrastructure Self Service.

**Unit 2**

**Cloud Services and Solutions:** Gamut of Cloud Solutions, Principal Technologies, Cloud Strategy, Cloud Design and Implementation using SOA, Conceptual Cloud Model, Cloud Service Defined.

**Cloud Solutions:** Introduction, Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management, Cloud Stack, Computing on Demand (CoD), Cloud sourcing.

### Unit 3

**Cloud Offerings and Cloud Management:** Cloud Offerings, Information Storage, Retrieval, Archive and Protection, Cloud Analytics, Testing under Cloud, Information Security, Virtual Desktop Infrastructure, Storage Cloud.

**Cloud Management:** Resiliency, Provisioning, Asset Management, Cloud Governance, High Availability and Disaster Recovery, Charging Models, Usage Reporting, Billing and Metering

### Unit 4

**Cloud Virtualization Technology:** Virtualization Defined, Virtualization Benefits, Server Virtualization, Virtualization for x86 Architecture, Hypervisor Management Software, Logical Partitioning (LPAR), VIO Server, Virtual Infrastructure Requirements, Storage virtualization, Storage Area Networks, Network-Attached storage, Cloud Server Virtualization, Virtualized Data Center.

### Unit 5

**Cloud Computing Web Services:** Google Web service, Surveying the Google application portfolio, Google toolkit, Amazon web services, Components and services, EC2- Storage systems, Database services, Microsoft cloud services, Windows azure platform, Windows live.

**Cloud Infrastructure:** Managing the cloud, Administrating the cloud, Management products, communicating with the cloud, Instant messaging, Collaboration technologies, Social networks, Media and streaming.

### Suggested Reading

- Barrie Sosinsky, “Cloud Computing Bible”, 1<sup>st</sup> Edition, 2011, Wiley Publishing.
- John Rhoton, “Cloud Computing Explained: Implementation Handbook for Enterprises”, 2<sup>nd</sup> Edition, 2013, Recursive Press, (CRC Press)
- Kumar Saurabh, “Cloud Computing: Insights into New-Era Infrastructure”, 1<sup>st</sup> Ed, 2011, Wiley India
- Rajkumar Buyya, Christian Vecchiola and Thamari Selvi S, “Mastering in Cloud Computing”, 1<sup>st</sup> Edition, 2013, McGraw Hill Education Michael Miller, “Cloud Computing”, 1<sup>st</sup> Edition, 2012, Pearson Education.
- Kris Jamsa, “Cloud Computing”, 1<sup>st</sup> Edition, 2013, Jones & Bartlett Publishers
- Anthony T Velte, “Cloud Computing: A practical Approach”, 1<sup>st</sup> Ed, 2010, Tata McGraw Hill.
- Fern Halper, Kaufman, Bloor Robin, Hurwit, “Cloud Computing for Dummies”, 1<sup>st</sup> Ed, 2010, Wiley
- Pethuru Raj, “Cloud Enterprise Architecture”, 1<sup>st</sup> Edition, 2012, CRC Press
- Ritthighouse, Ransome, “Cloud Computing: Implementation, Mgmt & Security”, 1<sup>st</sup>Ed, 2012, CRC Press
- Venkata Josyulla, Malcoom Orr, Greg Page, “Cloud Computing”, 1<sup>st</sup> Ed, 2010, Pearson

## DC01BD-5D1 Cryptography and Network Security

**Theory + Tutorial**

**Total Timings - 90hours**

### **Goal:**

This course will provide students with a practical and theoretical knowledge of cryptography and network security.

1. Ability to apply methods for authentication, access control, intrusion detection and prevention.
2. Ability to identify and mitigate software security vulnerabilities in existing systems

### **Objective:**

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Have a strong understanding of different cryptographic protocols and techniques and be able to use them.

### **Unit 1**

**Introduction:** Security Goals, Cryptographic Attacks, Services and Mechanism, Techniques. Mathematics of Cryptography: Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence.

### **Unit 2**

**Transformations:** Traditional Symmetric-Key Ciphers: Introduction, Substitution Ciphers, Transpositional Ciphers, Stream and Block Ciphers. Data Encryption Standard (DES): Introduction, DES Structure, DES Analysis, Security of DES, Multiple DES, Examples of Block Ciphers influenced by DES. Advanced Encryption Standard: Introduction, Transformations, Key Expansion, The AES Ciphers, Examples, Analysis of AES.

### **Unit 3**

**Cryptography:** Encipherment using Modern Symmetric-Key Ciphers: Use of Modern Block Ciphers, Use of Stream Ciphers, Other Issues. Mathematics of Asymmetric-Key Cryptography: Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm. Asymmetric Key Cryptography: Introduction, RSA Cryptosystem, Rabin Cryptosystem, Elgamal Cryptosystem, Elliptic Curve Cryptosystems.

### **Unit 4**

**Functions:** Cryptography Hash Functions: Introduction, Description of MD Hash Family, Whirlpool, SHA-512. Digital Signature: Comparison, Process, Services, Attacks on Digital Signature, Digital Signature Schemes, Variations and Applications. Key Management: Symmetric-Key Distribution, Kerberos, Symmetric-Key Agreement, Public-Key Distribution, Hijacking.

### **Unit 5**

**Network Security:** Security at the Application Layer: PGP and S/MIME: Email, PGP, S/MIME. Security at the Transport Layer: SSL and TLS: SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security. Security at the Network Layer: IPsec: Two modes, Two security protocols, Security association, security policy, Internet Key exchange, ISAKMP.

### **Suggested Reading:**

- Behrouz A. Forouzan, Debdeep Mukhopadhyay. (2011). *Cryptography and Network Security*, 2<sup>nd</sup> Ed., Special Indian Edition, Tata McGraw-Hill.
- Michael E. Whitman and Herbert J. Mattord. (2012). *Principles of Information Security*, 2<sup>nd</sup> Ed., Thomson, Cengage Delmar Learning.
- William Stallings. (2012). *Network Security Essentials: Applications and Standards*, 4<sup>th</sup> Ed., Pearson Education.

## DC01BD-5D2 Programming Using Python

**Theory + Practical**

**Total Timings - 60 hours**

### **Goal:**

The course is designed to provide an introduction to the Python programming language. The focus of the course is to provide students with an introduction to programming, I/O, and visualization using the Python programming language.

Upon the successful completion of this course, the student will be able to:

1. Install and run the Python interpreter
2. Create and execute Python programs
3. Understand the concepts of file I/O
4. Be able to read data from a text file using Python
5. Plot data using appropriate Python visualization libraries

### **Course Objectives:**

1. To learn about the fundamentals of computers
2. To learn how to install Python, start the Python shell
3. To learn to perform basic calculations, print text on the screen and create lists, and perform simple control flow operations using if statements and for loops
4. To learn how to reuse code with functions

### **Unit 1**

**Planning the Computer Program:** Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

### **Unit 2**

**Techniques of Problem Solving:** Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

### **Unit 3**

**Overview of Programming:** Structure of a Python Program, Elements of Python.

### **Unit 4**

**Introduction to Python:** Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

### **Unit 5**

**Creating Python Programs:** Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

### **Suggested Reading**

- LjubomirPerkovic, "Introduction to Computing Using Python: An Application DevelopmentFocus", John Wiley & Sons, 2012
- T. Budd. (2011). *Exploring Python*, TMH.
- Python Tutorial/Documentation [www.python.org](http://www.python.org) 2015
- Allen Downey, Jeffrey Elkner, Chris Meyers. (2012). *How to think like a computer Scientist: learning with Python*, Freely available online.2012
- <http://docs.python.org/3/tutorial/index.html>

**Software Lab Based on Python:**

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

**Section: A (Simple programs)**

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon users choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
  - a. Grade A: Percentage  $\geq 80$
  - b. Grade B: Percentage  $\geq 70$  and  $< 80$
  - c. Grade C: Percentage  $\geq 60$  and  $< 70$
  - d. Grade D: Percentage  $\geq 40$  and  $< 60$
  - e. Grade E: Percentage  $< 40$
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input paramters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to implement the use of arrays in Python.
7. WAP to implement String Manipulation in python in Python.
8. WAP to find sum of the following series for n terms:  $1 - 2/2! + 3/3! - \dots - n/n!$
9. WAP to calculate the sum and product of two compatible matrices.

**Section: B (OOPs using Python):**

*All the programs should be written using user defined functions, wherever possible.*

1. WAP to create Class and Objects in Python.
2. WAP to implement Data Hiding in Python.
3. WAP to implement constructor and destructor for a class in Python.
4. WAP to implement constructor and destructor in Python.
5. WAP to implement different types of inheritance in Python.
6. WAP to implement concept of Overriding in Python.
7. Write programs to create mathematical 3D objects using class.
  - a. curve b. sphere c. cone d. arrow e. ring f. cylinder

**List of Exercises**

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:  
Grade A: Percentage  $\geq 80$   
Grade B: Percentage  $\geq 70$  and  $< 80$   
Grade C: Percentage  $\geq 60$  and  $< 70$   
Grade D: Percentage  $\geq 40$  and  $< 60$   
Grade E: Percentage  $< 40$
3. Program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.

4. Program to display the first n terms of Fibonacci series.
5. Program to find factorial of the given number.
6. Program to find sum of the following series for n terms:  $1 - 2/2! + 3/3! - \dots - n/n!$
7. Program to calculate the sum and product of two compatible matrices.
8. Program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula  $m=60/(t+2)$ , where t is the time in hours. Sketch a graph for t vs. m, where  $t \geq 0$ .
9. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:  

$$P(t) = (15000(1+t))/(15 + e^t)$$
 where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.
10. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
  - I. velocity wrt time ( $v=u+at$ )
  - II. distance wrt time ( $s=u*t+0.5*a*t*t$ )
  - III. distance wrt velocity ( $s=(v*v-u*u)/2*a$ )

## DC01BD-6C1 Big Data Analytics with Hadoop

**Theory + Tutorial**

**Total Timings - 90hours**

### **Goal:**

This course will help gain the ability to initiate and design highly scalable systems that can accept, store, and analyse large volumes of unstructured data in batch mode and/or real time.

1. Ability to use business intelligence and analytics, which include the use of data, statistical and quantitative analysis, exploratory and predictive models, and evidence-based methods to inform business decisions and actions.
2. To apply select data mining techniques to business decision-making situations.

### **Course Objectives:**

1. To optimize business decisions and create competitive advantage with Big Data analytics
2. To explore the fundamental concepts of big data analytics.

### **Unit 1**

**Introduction to Big Data Business Analytics:** State of the practice in analytics role of data scientists - Key roles for successful analytic project Main phases of life cycle - Developing core deliverables for stakeholders; Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

### **Unit 2**

**Introduction to Streams Concepts:** Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

### **Unit 3**

**History of Hadoop:** Hadoop Distributed File System – Components of Hadoop Analysing the Data with HadoopScaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features; Hadoop environment.

### **Unit 4**

**Applications on Big Data Using Pig and Hive:** Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Simple linear regression- Multiple linear regression- Interpretation 5 of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.



### **Suggested Reading:**

- Chris Eaton, Dirk Deroos, Tom Deutsch et al., (2012). *Understanding Big Data*, McGrawHill, 2012.
- Alberto Cordoba. (2014). *Understanding the Predictive Analytics Lifecycle*, Wiley.
- Eric Siegel, Thomas H. Davenport. (2013). *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die*. Wiley.
- James R Evans (2013). *Business Analytics – Methods, Models and Decisions*, Pearson.
- R. N. Prasad, Seema Acharya (2015). *Fundamentals of Business Analytics*, Wiley.
- S M Ross (2011). *Introduction to Probability and Statistics for Engineers and Scientists*, Academic Foundation.

## DC01BD-6C2 Artificial Intelligence

**Theory + Tutorial**

**Total Timings - 90hours**

### **Goal:**

The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand what the AI is. Due to limited time, we will try to eliminate theoretic proofs and formal notations as far as possible, so that the students can get the full picture of AI easily. Students who become interested in AI may go on to the graduate school for further study. Ability to understand problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming, machine learning, and so on. Ability to realize the intelligent human behaviors on a computer.

### **Course Objectives:**

To gain the most fundamental knowledge for understanding AI. To introduce some basic search algorithms for problem solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks.

### **Unit 1**

**Introduction:** Introduction to AI, history of AI, course logistics; Intelligent agents, uninformed search; Heuristic search, Stochastic search methods; A\* algorithm; Adversarial search, games-minimax, alpha-beta pruning.

### **Unit 2**

**Basic Concepts:** Constraint Satisfaction Problems; Machine Learning: Basic concepts, linear models, perception, K nearest neighbours; Machine Learning: advanced models, neural networks, SVMs, decision trees and unsupervised learning.

### **Unit 3**

**Decision processes:** Markov decision processes and reinforcement learning; Logical Agent, propositional logic and first order logic.

### **Unit 4**

**AI Applications:** AI applications (NLP); AI applications.

### **Suggested Reading:**

- Elaine Rich And Kevin Knight (2008). *Artificial Intelligence*. 3rd Ed. Tata McGraw Hill.
- Stuart Russel, Peter Norvig. (1995). *Artificial Intelligence: A Modern Approach*, PHI.
- Ivan Bratko. (2013). *PROLOG Programming for Artificial Intelligence*. 4<sup>th</sup> Ed. Pearson.

## DC01BD-6S1 Industry Academia Interactions

**Theory**

**Total Timings - 30hours**

**Goal:**

Learners should be able to:

- Speak confidently with any speakers of English, including native speakers,
- Speak effortlessly in different contexts – informal and formal,

**Objective**

Learners would be able to:

- ‘Think on feet’ even in difficult circumstances,
- Hold interesting and meaningful conversations with others, including strangers,
- Listen to others with utmost attention.

**Unit 1**

**Personal Communication:** Day-to-day conversation with family members, neighbours, relatives, friends on various topics, context specific – agreeing/disagreeing, wishing, consoling, advising, persuading, and expressing opinions, arguing.

**Unit 2**

**Social Communication:** Telephone calls (official), colleagues in the work spot, discussing issues (social, political, cultural) clubs (any social gathering), answering questions, talking about films, books, news items, T.V. programmes, sharing jokes.

**Unit 3**

**Group/Mass Communication:** Group discussion (brainstorming ), debate, panel discussion, anchoring/master of ceremony, welcome address, proposing vote of thanks, introducing speakers, conducting meetings, making announcements, Just-a-minute (JAM), Block and tackle, shipwreck, spoof, conducting quiz, negotiations, oral reports.

**Unit 4**

**Integrated Speaking & Presentation Skills:** Listening to speak (any radio programme/lecture), reading to speak, writing to speak, watching to speak, (any interesting programme on TV) Reading aloud any text/speech, lecturing, PowerPoint presentation, impromptu, Interviews of different kinds (one to one, many to one, stress interview, telephonic interview).

**Unit 5**

**Employability & Corporate Skills:** Interview skills – Types of interview, preparation for interview, mock interview. Group Discussion –Communication skills in Group Discussion, Structure of GD, GD process, successful GD techniques, skills bought out in GD – leadership and co-ordination. Time management and effective planning – effective time management, time management techniques, relationship between time management and stress management. Stress management – causes and effect, coping strategies; Decision making and Negotiation skills, People skills, Team work, development of leadership qualities.

## **Suggested Reading**

- Richard Denny, “Communication to Win”; 1<sup>st</sup> Ed, 2008, Kogan Page India Pvt. Ltd.
- Sanjay Kumar, PushpLatha, “Communication Skills”, 1<sup>st</sup> Ed, 2011, Oxford University Press
- Courtland L. Bovee, John. V. Thill, “Business Communication Today”, 2<sup>nd</sup> Ed, 2007, Pearson
- Lesikar, Marie, E, Flatley, Rentz, N Pande.”Business Communication”, 3<sup>rd</sup> Ed, 2012, Mcgraw Hill
- R.C.Sharma, Krishna Mohan,”Business Correspondence and Report Writing”, 1<sup>st</sup> Ed, 2009, Mcgraw Hill
- Shirley Taylor, V.Chandra, “Communication for Business”, 1<sup>st</sup> Ed, 2008, Pearson
- HorySankar Mukherjee, “Business Communication’, 2<sup>nd</sup> Ed, 2009, Oxford University Press

## DC01BD-6D1 Processing Real Time Big Data

**Theory + Tutorial**

**Total Timings- 90 hours**

### **Goal:**

- To study issues related to the design and analysis of systems with real-time constraints.
- To learn the features of Real time OS.
- To learn about computer control and hardware requirements for Real time systems.

### **Objective:**

- To study the methods of developing Real time applications.
- To study the difference between different Real time system development methodologies.

### **Unit 1**

**Introduction:** Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write), Process Control ( fork, vfork, exit, wait, waitpid, exec).

### **Unit 2**

**Real Time Operating Systems:** Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

### **Unit 3**

**Objects, Services and I/O:** Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem.

### **Unit 4**

**Exceptions, Interrupts and Timers:** Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

### **Unit 5**

**Case Studies of RTOS:** RT Linux, Micro C/OS-II, Vx Works, Embedded Linux, and Tiny OS.

### **Suggested Reading:**

- Qing Li. (2011). *Real Concepts for Embedded Systems Time*, Elsevier.
- Rajkamal. (2007). *Embedded Systems- Architecture, Programming, and Design*, TMH.
- W. Richard Stevens, Stephan A. Rago, (2006). *Advanced UNIX Programming*, 2nd Ed., Pearson.
- Dr. Craig Hollabaugh. (2008). *Embedded Linux: Hardware, Software and Interfacing*, 1<sup>st</sup> Ed., Pearson.

## DC01BD-6D2 Project

### Goal:

On completion of the project student will have a professional portfolio of projects and real experience with data analysis that will give them the necessary confidence to be successful as a Data Analyst.

The students with the assistance of their faculty –in-charge or course coordinator will do the project (which may also be a continuation of their mini project or an altogether new project) individually in collaboration with an industry which would be assessed. The total credits would be 8. The students have to submit a project report and also have to attend a viva after their project presentation. Marks would be out of 100.

Students will be working in a team, as is usually the case in the world of work. Students will be supervised by a tutor, who is always available to answer any questions or clear up any doubts, and who will assess your performance and advise on the project "deliverables". The project work is an educational pedagogy that enables a student in learning-by-doing approach in all its complexity and scope.

At the start of the course Students are assigned a tutor who is a professional expert. The tutor will foster teamwork and promote discussion of issues, helping Students find Syllabus: Data Analytics & Big Data solutions and resolve the difficulties of the project by drawing on their own resources. They will give Students feedback on the “deliverables” for each project at every stage, so that Students can continually refine them, learning from their mistakes and achieving the mastery needed for each task.

### Some topics:

- Modern scientific instruments and Internet-scale applications generate voluminous data pertaining to vital signs, weather phenomena, social networks that connect millions of users, the origins of distant planets. Data produced in these settings hold the promise to significantly advanced knowledge.
- Fundamental issues in Big Data.
- Issues related to data organization, storage, retrieval, analysis and knowledge discover at scale.
- This will include topics such as large-scale data analysis, data storage systems, self-descriptive data representations, semi-structured data models.
- Will involve hands-on programming assignments and term project using real-world datasets.