

10 YEARS
OF UNIVERSITY
RECOGNITION
20 YEARS OF
ACADEMIC
EXCELLENCE



REVA
UNIVERSITY
Bengaluru, India

School of CSA

**B.Sc (Honour's)
(Computer Science -
Cloud Computing
and Big Data)**

**HANDBOOK
2020-2021**



SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

**Bachelor of Science (Honors) Computer Science-Cloud Computing
and Big Data**

HANDBOOK

2020

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**Rukmini Educational
Charitable Trust**

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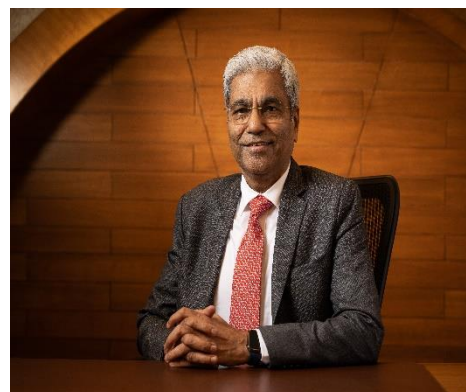
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Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."

- Nelson Mandela.

There was a time when survival depended on just the realization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference, however, lies between those who look for information and those who look for knowledge.



It is deemed virtuous to serve seekers of knowledge and as educators it is in the ethos at REVA University to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is power', we believe in building a community of perpetual learners by enabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student-centered and transformational approach. The excellent infrastructure at the University, both educational and extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students.

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

Dr. P. Shyama Raju

The Founder and Hon'ble Chancellor, REVA University

Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.



A strong believer and practitioner of the dictum “Knowledge is Power”, REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this ‘temple of learning’ has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts from industries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduates and postgraduates of Reva University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of “Technology Incubation Centers” in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

With firm faith in the saying, “Intelligence plus character –that is the goal of education” (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating “GLOBAL PROFESSIONALS”.

Welcome to the portals of REVA University!

Dr. K. Mallikharjuna Babu
Vice-Chancellor, REVA University

Director –Message

Welcome note to students

It's my pleasure to welcome you to the School of Computer Science and Applications. Computer, being considered as most significant and revolutionary invention of mankind has metamorphosed the planet earth completely. Predominantly School of Computer Science and Applications have acquired the control of the modern life in a myriad way.



The Bachelor of Science with specialization in Cloud Computing & Big Data program is designed keeping in view the current situation and possible future developments, both at national and global levels. This program is designed to give greater emphasis on Cloud Computing and Big Data analytics. This program on Cloud computing & Big Data will teach both the fundamental concepts of how and why Cloud systems works, as well as Cloud technologies such as Amazon AWS, Microsoft Azure, and Open Stack. Students will learn concepts like virtualization, private & public clouds. They will also become proficient in "Big Data" on various platforms. Besides a hands-on project, this program will include knowledge transfer by Industry experts. The lab sessions cover cloud application development and deployment, use of cloud storage, creation and configuration of virtual machines and data analysis on cloud using data mining tools. A variety of activities such as mini projects, seminars, interaction with industries, cultural activities and social activities are in place to shape the all-round development of students.

Students after successful completion of Bachelor of Science with specialization in Cloud Computing & Big Data program:

- Can design cloud-based Solutions/Architecture
- Can develop and deploy cloud application using popular cloud platforms
- Can build private cloud, Public Cloud & Hybrid Cloud
- Can design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud
- Can perform big data analysis in cloud

The curriculum caters to and has relevance to local, regional, national and global development needs. All courses are focussed on building skill, employability and entrepreneurship of students. Maximum number of courses are integrated with cross cutting issues with relevant to professional ethics, gender, human values, environment and sustainability.

I am sure the students choosing Bachelor of Science (Cloud Computing & Big Data) in REVA University will enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

Dr. S. Senthil

Director, School of Computer Science and Applications

RUKMINI EDUCATIONAL CHARITABLE TRUST

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of Rukmini Educational Charitable Trust (RECT), in the year 2002. **Rukmini Educational Charitable Trust** (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notched educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name a few. The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by committed administrative and technical staff. Over 13,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette No. 80 dated 27thFebruary, 2013. The University is empowered by UGC to award degrees any branch of knowledge under Sec.22 of the UGC Act. The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

REVA University located in between Kempegowda International Airport and Bangalore city, has a sprawling green campus spread over 45 acres of land and equipped with state-of-the-art infrastructure that provide conducive environment for higher learning and research. The REVA campus has well equipped laboratories, custom-built teaching facilities, fully air-conditioned library and central computer center, the well planned sports facility with cricket ground, running track & variety of indoor and outdoor sports activities, facilities for cultural programs. The unique feature of REVA campus is the largest residential facility for students, faculty members and supportive staff.

The University is presently offering 23 Post Graduate Degree programs, 20 Degree and PG Degree programs in various branches of studies and has 12000+ students studying in various branches of knowledge at graduate and post graduate level and 302 Scholars pursuing research leading to PhD in 18 disciplines. It has 800+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis with knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on practice in respective areas and skill development to suit to respective job environment has been given while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of education has been introduced in all programs to facilitate students to opt for subjects of their choice in addition to the core subjects of the study and prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught by well experienced qualified faculty supported by

the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses, special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has also entered into MOUs with many industries, business firms and other institutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

REVA University recognizing the fact that research, development and innovation are the important functions of any university has established an independent Research and Innovation division headed by a senior professor as Dean of Research and Innovation. This division facilitates all faculty members and research scholars to undertake innovative research projects in engineering, science & technology and other areas of study. The interdisciplinary-multidisciplinary research is given the top most priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the core areas of research wherein our young faculty members are working include Data Mining, Cloud Computing, Image Processing, Network Security, VLSI and Embedded Systems, Wireless Sensor Networks, Computer Networks, IOT, MEMS, Nano- Electronics, Wireless Communications, Bio-fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, LED Lightings, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nano Tribology, Fuel Mechanics, Operation Research, Graph theory, Strategic Leadership and Innovative Entrepreneurship, Functional Development Management, Resource Management and Sustainable Development, Cyber Security, General Studies, Feminism, Computer Assisted Language Teaching, Culture Studies etc.

The REVA University has also given utmost importance to develop the much required skills through variety of training programs, industrial practice, case studies and such other activities that induce the said skills among all students. A full-fledged Career Development and Placement (CDC) department with world class infrastructure, headed by a dynamic experienced Professor & Dean, and supported by well experienced Trainers, Counselors and Placement Officers.

The University also has University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director facilitating skill related training to REVA students and other unemployed students. The University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student's variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC², VMware, SAP, Apollo etc, to facilitate student exchange and teacher-scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

The University has also given greater importance to quality in education, research, administration and all activities of the university. Therefore, it has established an independent Internal Quality division headed by a senior professor as Dean of Internal Quality. The division works on planning, designing and developing different quality tools, implementing them and monitoring the implementation of these quality tools. It concentrates on training entire faculty to adopt the new tools and implement their use. The division further works on introducing various examination and administrative reforms.

To motivate the youth and transform them to become innovative entrepreneurs, successful leaders of tomorrow and committed citizens of the country, REVA organizes interaction between students and successful industrialists, entrepreneurs, scientists and such others from time to time. As a part of this exercise great personalities such as Bharat Ratna Prof. C. N. R. Rao, a renowned Scientist, Dr. N R Narayana Murthy, Founder and Chairman and Mentor of Infosys, Dr. K Kasturirangan, Former Chairman ISRO, Member of Planning Commission, Government of India, Dr. Balaram, Former Director IISc., and noted Scientist, Dr. V S Ramamurthy, Former Secretary, DST, Government of India, Dr. V K Aatre, noted Scientist and former head of the DRDO and Scientific Advisor to the Ministry of Defense Dr. Sathish Reddy, Scientific Advisor, Ministry of Defense, New Delhi and many others have accepted our invitation and blessed our students and faculty members by their inspiring addresses and interaction.

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is 'Life Time Achievement Award' to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the "Founders' Day Celebration" of REVA University in presence of dignitaries, faculty members and students gathering and the first "REVA Life Time Achievement Award" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO on the occasion of Founder's Day Celebration, 6th January, 2016 and the second "REVA Life Time Achievement Award" for the year 2016 has been awarded to Shri. Shekhar Gupta, Renowned Journalist on the occasion of Founder's Day Celebration, 6th January, 2017.

REVA organizes various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVAMP conducted every year. The event not only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognized by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes every day to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

Recognizing the fast growth of the university and its quality in imparting higher education, the BERG (Business Excellence and Research Group), Singapore has awarded BERG Education Award 2015 to REVA University under Private Universities category. The University has also been honored with many more such honors and recognitions.

REVA University Vision

“REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards”.

Mission

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers
- To provide student-centric learning environment through innovative pedagogy and education reforms
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

- Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines
- Smooth transition from teacher - centric focus to learner - centric processes and activities
- Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position
- Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation
- Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

The School of Computer Science and Applications is shouldered by well qualified, experienced and highly committed faculty. The state-of-the-art infrastructure digital classrooms, well equipped advanced computer laboratory, conference rooms and the serene academic atmosphere at REVA University will enhance the transfer as well as creation of knowledge. The School offers BCA, B. Sc. (Honors) in Computer Science with specialization in Cloud Computing and Big Data, MCA and MS (Computer Science) programs. The School also has research program leading to doctoral degree. The curriculum of both graduate and post graduate degree programs have been designed to bridge the gap between industry – academia and hence they are industry oriented. These programs provide ample scope to enter into a wide range of business opportunities, entrepreneurship ventures and as well as job opportunities in different sectors. This is reflected in various core subjects / courses offered within the program. Further the school provides an interactive, collaborative peer tutoring environment that encourages students to break down complex problems and develop strategies for finding solutions across a variety of situations and disciplines. The school aims to develop a learning community of critical thinkers who serve as models of innovative problems solving in the university environment to enrich their academic and professional careers.

VISION

To transform students into good human beings, responsible citizens and competent professionals, focusing on assimilation, generation and dissemination of knowledge in the area of Computer Applications

MISSION

- To impart quality education to meet the needs of profession and society, and achieve excellence in teaching-learning and research in the area of Computer Applications;
- To attract and develop talented and committed human resource, and provide an environment conducive to innovation, creativity, team-spirit and entrepreneurial leadership in Computing field;
- To facilitate effective interactions among faculty and students of the School of Computer Applications, and foster networking with alumni, industries, institutions and other stake-holders; and
- To practice and promote high standards of professional ethics, transparency and accountability.

OBJECTIVES

- To impart programs at graduate, post-graduate and doctoral levels in the field of computer applications;
- To adopt innovative methods of teaching and promote student centric learning process;
- To create infrastructure of international standard and facilitate and create conducive environment for teaching, learning and research;
- To promote faculty development and encourage faculty members and students to organize and participate in national and international level conferences, seminars, symposia and such others;
- To encourage teachers and students to take-up interdisciplinary studies and research;
- To promote students participation in co-curricular and extension activities and develop their personality traits and team spirit

ADVISORY BOARD

SL. No	Name and Affiliation
1	Dr. B.S.Anami Principal, KLE Institute of Technology, Hubli.
2	Dr.M N Birje Professor &Head, Department of Computer Applications, VTU, Belagvi.
3	Dr.Sathish Babu Professor & Head, Department of Computer Science, SIT,Tumkur.
4	Dr.P Nagabhusan Director, IIIT Allahabad.
5	Dr.Pethuru Raj Chief Architect & Vice President, Site Reliability Engineering (SRE), Division,Reliance Jio Infocomm Limited.
6	Mr.Raja Krishnamoorthy Director, SAP, Cognizant Technology Pvt.Ltd, Bengaluru.
7	Dr.Madan Kumar Srinivasan Associate Vice President, AI Innovation Centre, Accenture, Bengaluru.

Programme Overview

The Bachelor of Science (Honors) Computer Science-Cloud Computing and Big Data programme is designed keeping in view the current situation and possible future developments, both at national and global levels. This programme is designed to give greater emphasis on Cloud Computing and Big Data analytics. This programme on Cloud computing & Big Data will teach both the fundamental concepts of how and why Cloud systems works, as well as Cloud technologies such as Amazon AWS, Microsoft Azure, and Open Stack. Students will learn concepts like virtualization, private & public clouds. They will also become proficient in "Big Data" on various platforms. Besides a hands-on project, this program will include knowledge transfer by Industry experts. The lab sessions cover cloud application development and deployment, use of cloud storage, creation and configuration of virtual machines and data analysis on cloud using data mining tools. A variety of activities such as mini projects, seminars, interaction with industries, cultural activities and social activities are in place to shape the all-round development of students.

There is a dearth for cloud engineers, data scientists, data analysts, cloud architects. This programme aims in fulfilling the demand by sending graduates equipped for the industry.

The School of Computer Science and Applications at REVA UNIVERSITY has designed to offer B.Sc(H) (Computer Science-Cloud Computing and Big Data) programme as an undergraduate degree programme to create motivated, enthusiastic, thinking and creative graduates to fill the roles as computer algorithm developers, computer programmers, computer application developers, professors, scientists, professionals and administrators.

The B.Sc(H) (Computer Science-Cloud Computing and Big Data) programme at **School of Computer Science and Applications** has been designed and developed by industry experts. The cloud related subjects are handled by corporate trainers and it is in par with the industry standards.

The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, analytical thinking and problem solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in communication skills and interdisciplinary topics to enhance their scope. The above mentioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with industry and research organizations makes this programme unique.

Program Educational Objectives (PEO's)

The programme acts as a foundation degree and helps to develop critical, analytical and problem solving skills at first level. The foundation degree makes the graduates employable in IT industries, scientific organisations and also to assume administrative positions in various types of organisations. With further acquisition of higher level degrees help the graduates to pursue a career in academics or scientific organisations as a researcher.

The Programme Educational Objectives are to prepare the students to:

PEO-1	Be cloud engineers , data analysts, data scientists and cloud architects and Operate various cloud related commercial software tools to solve scientific and business problems.
PEO-2	Be computer Application Developers, Algorithm developers, Computer Programmers and to Work alongside engineering, medical, ICT professionals and scientists to assist them in setting up a cloud in their area of domain.
PEO-3	Adopt lifelong learning philosophy for continuous improvement to which qualifies them to become professionals in various levels as administrators in public, private organisations or as scientists in research establishments
PEO-4	Understand environmental, legal, cultural, social, ethical, public safety issues and Work as a member of a team and communicate effectively across team members to set his/her own enterprise with further training

Program Outcomes For B.Sc (HONS) in Computer Science- Cloud computing and Big Data

After undergoing this programme, a student will be able to:

- **PO 1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of computer science with specialization in Cloud computing and Big data analytics that form a part of B.Sc(Honors) in Computer Science –Cloud Computing and Big Data
- **PO 2: Scientific reasoning:** Ability to analyze, and understand concepts in computer science, critically evaluate ideas, logical reasoning and experiences in programming, algorithm development and application development.
- **PO 3: Problem solving:** Capacity to extrapolate and apply competencies to solve different kinds of non-familiar problems, such as design cloud-based Solutions/Architecture, develop and deploy scalable cloud application using popular cloud platforms, build private cloud, Public Cloud & Hybrid.
- **PO 4: Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development and provide solutions for the same using domain knowledge in Cloud computing.

- **PO 5: Research-related skills:** Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation in data analytics.
- **PO 6: Ethics:** Conduct as a responsible citizen by recognizing different value systems and understand the **moral dimensions** of decisions, and **accept responsibility** for them.
- **PO 7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
- **PO 8: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups
- **PO 9: Self-directed and Life-long Learning:** Acquire the ability to engage in independent and **life-long learning** in the broadest context socio-technological changes.

PROGRAMME SPECIFIC OUTCOMES:

After successful completion of the Programme, the graduates will be able to

1. Design cloud-based Solutions or Architecture, and use the popular cloud platforms to develop and deploy cloud applications.
2. Provide computer based solutions for real life problems by developing specific software products.
3. Design and develop a highly scalable cloud-based applications by configuring virtual machines on the cloud

School of Computer Science & Applications

B. Sc (Honors) Scheme 2020-2023

FIRST SEMESTER

S.NO	Code	Title	HC/ SC/ FC	Credit Pattern			Credits	Working Hrs.
				L	T	P		
1	B20BS1011	Language –I Kannada	FC	2	1	0	3	4
	B20BS1012	Language –I Hindi	FC					
	B20BS1013	Language –I Additional English	FC					
2	B20BS1020	Communicative English	FC	2	1	0	3	4
3	B20BS1030	Discrete Mathematical Structures	HC	2	1	0	3	4
4	B20BS1040	Programming using C	HC	2	1	0	3	4
5	B20BS1050	Operating Systems And Linux Foundation	HC	4	0	0	4	4
6	B20BS1060	Computer Organization and Architecture	HC	2	1	0	3	4
Practical Courses								
7	B20BS1070	C Programming Lab	HC	0	0	2	2	4
8	B20BS1080	Linux Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
9	B20BS1090	Environmental Studies						
10	B20BS1100	Skill Development Program						
Total Credits				14	5	4	23	32

SECOND SEMESTER

S.N O	Code	Title	HC/ SC/ FC	Credit Pattern			Credits	Working Hrs.
				L	T	P		
1	B20BS2011	Language –II Kannada	FC	2	1	0	3	4
	B20BS2012	Language –II Hindi	FC					
	B20BS2013	Language –II Additional English	FC					
2	B20BS2020	Communicative English	FC	2	1	0	3	4
3	B20BS2030	Probability and Statistics	HC	4	0	0	4	4
4	B20BS2040	Cloud Computing and Virtualization Foundation	HC	3	0	1	4	5
5	B20BS2050	Advanced Linux	HC	2	1	0	3	4
6	B20BS2060	Relational Database Management Systems	HC	3	0	1	4	5
7	B20BS2070	Data Structures Using C	HC	2	1	0	3	4
Practical Courses								
8	B20BS2080	Data Structures Lab	HC	0	0	2	2	4
9	B20BS2090	Advanced Linux Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
10	B20BS2100	Constitution of India & Professional Ethics						
11	B20BS2110	Skill Development Program						
Total Credits				18	4	6	28	38

THIRD SEMESTER

Sl. No	Code	Title	H C/ SC /F C	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS3011	Language –III Kannada	FC	2	0	0	2	2
	B20BS3012	Language –III Hindi						
	B20BS3013	Language –III Additional English						
2	B20BS3020	Cloud Computing Architecture and Design	HC	2	1	0	3	4
3	B20BS3030	Computer Networks	HC	3	1	0	4	5
4	B20BS3040	Data mining & Data warehousing	HC	4	0	0	4	4
5	B20BS3050	Python Foundation	HC	3	0	0	3	3
6	B20BS3061	Advanced Virtualization Concepts	SC	3	0	0	3	3
	B20BS3062	Linear Algebra						
	B20BS3063	E-Commerce						
Practical Courses								
7	B20BS3070	Cloud Computing Architecture and Design Lab	HC	0	0	2	2	4
8	B20BS3080	Python Foundation Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
9	B20BS3090	Soft skills						
10	B20BS3100	Skill Development Program						
Total Credits				17	2	4	23	29

FOURTH SEMESTER

Sl. No	Code	Title	HC /SC /FC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS4011	Language –IV Kannada	FC	2	0	0	2	2
	B20BS4012	Language –IV Hindi						
	B20BS4013	Language –IV Additional English						
2	B20BS4020	Public Cloud –AWS,AZURE and GOOGLE	HC	3	0	0	3	3
3	B20BS4030	Software Engineering	HC	2	1	0	3	4
4	B20BS4040	Automation Tools For Cloud Deployment	HC	2	0	1	3	4
5	B20BS4050	Cloud Developer tools and Ecosystem	HC	3	0	0	3	3
6	B20BS4061	Advanced Computer Networks	SC	3	0	0	3	3
	B20BS4062	Cyber Physical systems						
	B20BS4063	The Internet Of things						
7	B20BS4071	Programming with Ruby & Golang	SC	2	0	1	3	4
	B20BS4072	Introduction to Web Programming						
	B20BS4073	Java Programming						
Practical Courses								
8	B20BS4080	Public Cloud –AWS,AZURE and GOOGLE Lab	HC	0	0	2	2	4
9	B20BS4090	Cloud Developer tools and Ecosystem Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
10	B20BS4100	Soft skills						
11	B20BS4110	Skill Development Program						
Total Credits				17	1	6	24	31

FIFTH SEMESTER

Sl. No	Code	Title	HC/SC/FC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS5010	Building Private Cloud with Open Stack	HC	3	0	0	3	3
2	B20BS5020	Big Data Analytics using Hadoop	HC	2	0	1	3	5
3	B20BS5030	Machine learning foundation with Python	HC	3	0	1	4	5
4	B20BS5041	Public Cloud Networking And Security	SC	2	0	1	3	4
	B20BS5042	C# and .NET						
	B20BS5043	Advanced JAVA for Micro-services architecture						
5	B20BS5051	Cyber Security	SC	3	0	0	3	3
	B20BS5052	Cloud APP development						
	B20BS5053	Cloud Migration and Disaster recovery						
6		Open Elective	OE	3	0	0	3	3
Practical Courses								
7	B20BS5070	Building Private Cloud with Open Stack Lab	HC	0	0	2	2	4
8	B20BS5080	Minor Project	HC	0	0	3	3	6
*Mandatory - (Non Creditable Courses)								
9	B20BS5090	Soft skills						
10	B20BS5100	Skill Development Program						
Total Credits				16	0	8	24	34

Open Elective Courses offered to other Schools

Sl. No	Code	Title	HC/ SC/ OE	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS5061	Fundamentals of Cloud Computing	OE	3	0	0	3	3
2	B20BS5062	Basics of Data Analytics						

SIXTH SEMESTER

S.NO	Code	Title	H C/ SC /F C	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS6010	DevOps	H C	3	0	1	4	5
2	B20BS6021	Deployment & Management of Private Cloud	SC	3	0	1	4	5
	B20BS6022	Entrepreneurship and management						
	B20BS6023	Machine learning and AI on cloud						
Practical Courses								
3	B20BS6030	Major Project	H C	0	0	10	10	20
Total Credits				6	0	12	18	30

CREDIT SUMMARY

Semester	Credits
First	23
Second	28
Third	23
Fourth	24
Fifth	24
Sixth	18
Total	140

CREDIT DISTRIBUTION

Semester	Hard Core (HC)	Fundamental Core (FC)	Soft Core (SC)	Open Elective (OE)	Minor/Major Project	Total Credits
I	17	6	-	-	-	23
II	22	6	-	-	-	28
III	18	2	3	-	-	23
IV	16	2	6	-	-	24
V	12	-	6	3	3	24
VI	4	-	4	-	10	18
Total	89	16	18	4	13	140

**** Note:** Non _Creditable course: -> Skill Development Programme in all semesters

DETAILED SYLLABUS

FIRST SEMESTER

S.NO	Code	Title	HC/ SC/ FC	Credit Pattern			Credits	Working Hrs.
				L	T	P		
1	B20BS1011	Language –I Kannada	FC	2	1	0	3	4
	B20BS1012	Language –I Hindi	FC					
	B20BS1013	Language –I Additional English	FC					
2	B20BS1020	Communicative English	FC	2	1	0	3	4
3	B20BS1030	Discrete Mathematical Structures	HC	2	1	0	3	4
4	B20BS1040	Programming using C	HC	2	1	0	3	4
5	B20BS1050	Operating Systems And Linux Foundation	HC	4	0	0	4	4
6	B20BS1060	Computer Organization and Architecture	HC	2	1	0	3	4
Practical Courses								
7	B20BS1070	C Programming Lab	HC	0	0	2	2	4
8	B20BS1080	Linux Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
9	B20BS1090	Environmental Studies						
10	B20BS1100	Skill Development Program						
Total Credits				14	5	4	23	32

B20BS1011	LANGUAGE –I KANNADA	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

PRE-REQUISITE:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ..
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

COURSE OBJECTIVES:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಚೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

COURSE OUTCOMES:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

COURSE CONTENT:

Unit – 1: ಜನಪದ/ಪ್ರಾಚೀನ/ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

[10 Hours]

1. ಕೆರೆಗೆ ಹಾರ – ಜನಪದ
2. ಸಾಮಾನ್ಯಮೆ ಬಗೆಯೆ ಭವತ್ಕೇಶಪಾಶ ಪ್ರಪಂಚಂ? – ಪಂಪ
3. ಪೊಲ್ಲಮೆಯೆ ಲೇಸು ನಲ್ಲರ ಮೆಯ್ಯೊಳ್ – ಜನ್ನ

Unit – 2: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

[10 Hours]

1. ನಳಕೂಬರನ ಪ್ರಸಂಗ – ನಾಗಚಂದ್ರ
2. ವಚನಗಳು – ಆಯ್ದ ವಚನಗಳು
3. ಇಳೆಯಾಂಡ ಗುಡಿಮಾರನ ರಗಳೆ – ಹರಿಹರ

Unit –3: ಸಣ್ಣ ಕಥೆಗಳು

[10 Hours]

1. ಕೊನೆಯ ಗಿರಾಕಿ – ನಿರಂಜನ
2. ಪ್ರಜಾಪ್ರಭುತ್ವ ಮತ್ತು ಮೂರು ಮಂಗಗಳು – ಬೆಸಗರಹಳ್ಳಿ ರಾಮಣ್ಣ
3. ಬೆಂದಕಾಳೂರು – ವಿಜಯ ಹೂಗಾರ

Unit -4: ನಾಟಕ

[09 Hours]

1. ಜಲಗಾರ – ಕುವೆಂಪು

Text Books:

Reference Book:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2008
3. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
4. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007
5. ನಾರಾಯಣ ಪಿ.ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರಿ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010

B20BS1012	LANGUAGE –I HINDI	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

यह पाठ्यक्रम नौसिखिया, अपनी भाषा की क्षमता का विकास करने हेतु तथा विभिन्न साहित्यिक प्रक्रियाओं द्वारा समाज, संस्कृति एवं जीवन के मूल्यों को समझने हेतु अभिकल्पित है।

PRE-REQUISITE:

- अध्येता, पी.यु.सी के स्तर पर द्वितीय भाषा के रूप में हिन्दी का अध्ययन करना चाहिए।
- हिन्दी साहित्य के इतिहास का संक्षिप्त ज्ञान की आवश्यकता है।
- हिन्दी व्याकरण का अवबोधन आवश्यक है।
- अंग्रेज़ी – हिन्दी अनुवाद से संबंधित जानकारी जरूरी है।

COURSE OBJECTIVES:

1. संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।
2. साहित्य के माध्यम से समाज एवं मानवीय मूल्यों को समझाकर, उन मूल्यों की रक्षा हेतु प्रेरित करना।
3. छात्रों में पुस्तक पठन एवं लेखन की अकृतिम प्रवृत्ति स्थापित करना।
4. अध्येताओं में साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास करना।

COURSE OUTCOMES:

अध्ययन की समाप्ति पर अध्येता –

1. सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है।
2. साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है।
3. समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
4. साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

COURSE CONTENT:

UNIT I

[10 Hours]

- 1 कहानी – तावान – प्रेमचंद

- 2 कहानी – उसकी रोटी – मोहन राकेश
- 3 व्यंग्य रचना – वैष्णव की फिसलन – हरीशंकर परसाई

UNIT II

[10 Hours]

- 4 कहानी – वापसी - उषा प्रियंवदा
5. कहानी – तीसरी बेटी के नाम - सुधा अरोड़ा
6. निबंध – अच्छी हिन्दी – रवीन्द्रनाथ त्यागी

UNIT III

[10 Hours]

- 7 कहानी – जल्लाद – पांडेय बेचन शर्मा 'उग्र'
- 8 रेखाचित्र – बुधिया कब आएगा – ज्ञानचंद मर्मज्ञ
- 9 एकांकी – अंधेर नगरी – भारतेन्दु हरिश्चंद्र

UNIT IV

[09 Hours]

अनुवाद अनुच्छेद (अंग्रेजी से हिन्दी में)
संक्षेपण
निबंध लेखन

सूचना : प्रत्येक इकाई 25 अंक के लिए निर्धारित है ।

Text Books:

- हिन्दी पाठ्य पुस्तक – रेवा विश्वविद्यालय ।

Reference Book:

1. सुबोध व्यवहारिक हिन्दी – डॉ. कुलदीप गुप्त
2. अभिनव व्यवहारिक हिन्दी – डॉ.परमानन्द गुप्त
3. हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
4. आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
5. हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
6. शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
7. कार्यालय अनुवाद निदेशिका
8. संक्षेपण और पल्लवन - के.सी.भाटिया&तुमन सिंग
9. हिन्दी निबंध लेखन – प्रो. विराज
10. निबंध माला – योगेशचंद्र जैन

B20BS1013	LANGUAGE –I ADDITIONAL ENGLISH	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

This is a 3-credit course designed to help the learner gain competency in language through the introduction of various genres of literature. The course aims to inculcate a critical view among learners while sensitizing them to the contemporary issues around. It facilitates creative learning and helps to appreciate, assimilate and research on the various dimensions of society, culture and life.

PRE-REQUISITE:

The student must possess fundamentals of language skills and be aware of social issues.

COURSE OBJECTIVES:

- To develop linguistic prowess of the students.
- To appraise different genres of literature.
- To illustrate the fundamentals of creative language.
- To enhance consistent reading habits.

COURSE OUTCOMES:

On completion of the course, learners will be able to:

- Demonstrate a thorough understanding of sensitive and critical social issues.
- Develop reading skills and a wide range of vocabulary.
- Critically analyze a piece of prose or poetry.
- Explain their opinion in a coherent and communicable manner.

COURSE CONTENT:

UNIT I Values & Ethics

[09 Hours]

Literature: Rabindranath Tagore - Where the Mind is Without Fear
 William Wordsworth – Three Years She Grew in Sun and Shower
 Saki – The Lumber-room
 William Shakespeare – Extract from Julius Caesar (Mark Antony’s Speech)
 Language: Vocabulary Building

UNIT II Natural & Supernatural**[10 Hours]**

Literature: John Keats – La Belle Dame Sans Merci
Charles Dickens – The Signal Man
Hans Christian Anderson - The Fir Tree

William Shakespeare – An Excerpt from The Tempest
Language: Collective Nouns

UNIT III Travel & Adventure**[10 Hours]**

Literature: R.L. Stevenson – Travel
Elizabeth Bishop - The Question of Travel
H.G. Wells – The Magic Shop
Jonathan Swift – Excerpt from Gulliver’s Travels Book – I
Writing Skills: Travelogue

UNIT IV Success Stories**[10 Hours]**

Literature: Emily Dickinson – Success is Counted Sweetest
Rupert Brooke – Success
Dr. Martin Luther King - I Have a Dream
Helen Keller – Excerpt from The Story of My Life
Writing Skills: Brochure & Leaflet

Reference Books:

- Tagore, Rabindranath. Gitanjali. Rupa Publications, 2002.
- Wordsworth, William. The Complete Works of William Wordsworth. Andesite Press, 2017.
- Munro, Hector Hugh. The Complete Works of Saki. Rupa Publications, 2000.
- Shakespeare, William. The Complete Works of William Shakespeare. Sagwan Press, 2015.
- Chindhade, Shirish. Five Indian English Poets: Nissim Ezekiel, A.K. Ramanujan, ArunKolatkar, DilipChitre, R. Parthasarathy. Atlantic Publications, 2011.
- Dickens, Charles. The Signalman and Other Horrors: The Best Victorian Ghost Stories of Charles Dickens: Volume 2. Createspace Independent Publications, 2015.
- Anderson, Hans Christian. The Fir Tree. Dreamland Publications, 2011.
- Colvin, Sidney (ed). The Works of R. L. Stevenson. (Edinburgh Edition). British Library, Historical Prints Edition, 2011.
- Bishop, Elizabeth. Poems. Farrar, Straus and Giroux, 2011.
- Swift, Jonathan. Gulliver’s Travels. Penguin, 2003.
- Dickinson, Emily. The Complete Poems of Emily Dickinson. Createspace Independent Publications, 2016.
- Brooke, Rupert. The Complete Poems of Rupert Brooke. Andesite Press, 2017.
- King, Martin Luther Jr. & James M. Washington. I Have a Dream: Writings And Speeches That Changed The World. Harper Collins, 1992.
- Keller, Helen. The Story of My Life. Fingerprint Publishing, 2016.
- Green, David. Contemporary English Grammar Structures and Composition. New Delhi: MacMillan Publishers, 2010.
- Thorpe, Edgar and Showick Thorpe. Basic Vocabulary. Pearson Education India, 2012.
- Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Longman, 2003.

- Murphy, Raymond. Murphy's English Grammar with CD. Cambridge University Press, 2004.

B20BS1020	COMMUNICATIVE ENGLISH	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

This 3-credit course focuses on improving the spoken and written communication of the learners. The course develops personal, inter-personal and group skills among learners. It also addresses the functional aspects of language usage while providing specific linguistic tools through professional language learning software. The widespread reach of this course makes it highly practical and applicable.

PRE-REQUISITE:

The student must have knowledge of intermediate English Grammar and LSRW skills.

COURSE OBJECTIVES:

- To enhance functional communication skills.
- To develop functional use of language in professional contexts.
- To utilize oral presentations in multiple contexts.
- To apply effective written skills in formal communication.

COURSE OUTCOMES:

After the completion of the course, students will be able to:

- Identify pressing issues relating to society, environment and media.
- Develop a process-oriented approach to writing.
- Apply the grammatical skills developed during the course aptly.
- Demonstrate a good command over language usage and refined interpersonal skills.

COURSE CONTENT:

UNIT I Functional English

[09 Hours]

Remedial Grammar: Past Simple; Past Continuous; Irregular Verbs

Writing Skills: Paragraph Writing

Activities: Conversations; Leaving Phone Messages

Literature: Chief Seattle – The End of Leaving and Beginning of Survival

UNIT II Interpersonal Skills

[10 Hours]

Remedial Grammar: Present Simple & Present Continuous; Activity & State Verbs
 Writing Skills: Official Letters
 Activities: Making Apologies; Invitations & Making Arrangements
 Literature: Ruskin Bond – Tiger in the Tunnel

UNIT III Multitasking Skills

[10 Hours]

Remedial Grammar: Present Perfect; For, Since & How Long; -ed & -ing adjectives; Prefix & Opposites of Adjectives
 Writing Skills: Note Making
 Activities: Agreeing & Disagreeing with Opinions
 Literature: Jesse Owens - My Greatest Olympic Prize

UNIT IV Communication Skills

[10 Hours]

Remedial Grammar: Collocations; Prepositions
 Writing Skills: Precise Writing
 Activities: Offers, Suggestions & Requests
 Literature: Avijit Pathak – Onscreen Magic

Reference Books:

1. Green, David. Contemporary English Grammar Structures and Composition. New Delhi: MacMillan Publishers, 2010.
2. Thorpe, Edgar and Showick Thorpe. Basic Vocabulary. Pearson Education India, 2012.
3. Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Longman, 2003.
4. Murphy, Raymond. Murphy’s English Grammar with CD. Cambridge University Press, 2004.
5. Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill, 2005.
6. Riordan, Daniel. Technical Communication. New Delhi: Cengage Publications, 2011.
7. Sen et al. Communication and Language Skills. Cambridge University Press, 2015.

B20BS1030	DISCRETE MATHEMATICAL STRUCTURES	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

The purpose of this course is to understand and use discrete structures that are backbones of computer science. In particular, this class is meant to introduce logic, proofs, sets, relations, functions, counting, and probability, with an emphasis on applications in computer science.

PRE-REQUISITE:

Number System, Algebraic and Logarithmic concepts, and system of equations solving techniques

COURSE OBJECTIVES:

- To reflect on the concepts and operations of mathematical logic needed for computer science.
- To Examine and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- To interpret discrete knowledge in Computer Science through graph theory and its applications

COURSE OUTCOMES:

On completion of this course the student will be able to:

- Formulate and interpret statements presented in Boolean logic. Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus
- Demonstrate a working knowledge of set notation and elementary set theory, recognize the connection between set operations, critical thinking to arrive at conclusions from Venn Diagrams, syllogistic forms and prove elementary results involving sets
- Work with functions and in particular bijections, direct and inverse functions. Gain and historical perspective of the development of modern discrete mathematics.
- Recognize apply, and interpret multiple representations of properties of graphs such as distinctive circuits or trees. Apply mathematical principles and techniques to solve problems in areas such as ancient systems of numeration

COURSE CONTENT:

UNIT I Set Theory, Properties of Integers

[13 Hours]

Sets and its different types of sets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Principles of Inclusion and Exclusion, Permutations and Combinations with repetition and Mathematical Induction.

UNIT-II Fundamentals of Logic

[15 Hours]

Basic Connectives and Truth Tables, Logic Equivalence: The laws of Logic, Logical Implications: Rules of Inference, The use of Quantifiers and Quantifier Definitions.

UNIT III Relations and Functions

[13 Hours]

Cartesian products and Relations, Properties of Relations, Computer recognition-Zero One Matrices and Directed Graphs, Composite relations. Functions-Plain and One-to-One, Onto Functions, Sterling Numbers and the Second Kind, Special functions, The Pigeon-hole principle, Function composition and inverse functions.

UNIT-IV: Graph Theory

[13 Hours]

Terminology, Definitions, Properties and Examples, Connectivity and Adjacency, Euler and Hamilton, Representation and Isomorphism, Planarity and Chromatic Number, Directed Graphs and Weighted Graphs, Trees and its properties and types.

Text Books:

1. Ralph P Grimaldi, B.V.Ramana, “Discrete & Combinatorial Mathematics, An Applied Introduction” 5th Edition, Pearson Education, 2004.
2. Eric Gosset “Discrete Mathematics with Proof” Wiley India, 2nd Edition, 2010.

Reference Books:

1. Kenneth H Rosen, “Discrete Mathematics & its Applications” 7th edition, McGraw-Hill, 2010
2. Tremblay and Manohar R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, New Delhi, 2003.
3. Y N Singh “Discrete Mathematical Structures” Wiley India, 1st edition, 2010
4. JayantGanguly: A Treatise on Discrete Mathematical Structures" Pearson, 2010
5. D.S. Malik & M.K Sen: Discrete Mathematical Structures: Theory & Applications, Cengage Learning, 2004.
6. NarsinghDeo, Graph Theory with Applications to Engineering and Computer Science, PHI Learning Pvt. Ltd., 2004.
7. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008.
8. Dr.D.S.C, “Discrete Mathematical Structures”, Fourth Edition, 2014 – 2015.
9. K S Deshikachar, M Vinayaka Murthy and Udaya Rani, “ Discrete Mathematical Structures with Application to Computer Science”, Subhas Stores, Bengaluru, latest

B20BS1040	PROGRAMMING USING C	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

C programming is presented with an introduction to methods for the design of well-structured and maintainable computer programs. The course begins by introducing the syntax and semantics of the C programming language. It includes data types, operators and expressions, control flow logic, program structure, arrays, functions and file I/O. Practical activity includes the use of basic software development tools (debugging techniques, version control).

PRE-REQUISITE:

- To start with C programming you should have a basic understanding of Computer Programming terminologies and some knowledge about programming languages.

COURSE OBJECTIVES:

- Explain the basic programming concepts.

- Illustrate the importance of Algorithm to write the Program (in small steps).
- Divide a problem into its logical set of components.
- Describe how a good program design can reduce coding and debugging time.
- State the Problem Definition clearly.
- Introduce the concepts of Files for application data maintenance
- Provide detailed understanding of control statements, function and arrays.
- Illustrate the use of pointers and Strings.

COURSE OUTCOMES:

At the end of the course students will be able to

- Design Algorithms and Flowcharts to solve real world problems.
- List various data types and operators and develop programs to evaluate arithmetic expressions and mathematical functions.
- Identify the suitable control statements and implement the solution for any problem.
- Design programs to handle list of data and strings using arrays.

COURSE CONTENT:

UNIT I Computer Problem-Solving& Fundamental Algorithms [13 Hours]

Computer Basics, Introduction To Computer Problem-Solving, Fundamental Algorithms: Introduction, Exchanging the Values of Two variables, Counting, Summation of a Set of Numbers, Factorial Computation, Generation of the Fibonacci Sequence. Basics of C Programming: History of C, Importance of C, Basic Structure of C Programs, Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Declaration of Storage Class, Assigning Values to Variables.

UNIT II Operators and Expression [13 Hours]

Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators. Structured Constructs: Decision Making and Branching, Decision Making and Looping.

UNIT III Array and Functions [13 Hours]

Introduction, One-Dimensional Arrays, Initialization of One-Dimensional Arrays, Two Dimensional Arrays, Initializing Two Dimensional Arrays, Multi-Dimensional Arrays, Character Arrays and Strings: Introduction, Declaring and Initializing String Variables, Reading Strings from Screen, Writing Strings to Screen, String-Handling Functions. User-Defined Functions: Introduction, Need for User-Defined Functions Elements of User-Defined Functions, Definition of Functions, Return Values and their types, Function Calls, Function Declaration, Category of Functions, No arguments and No return values, Arguments but No return values, Arguments with return values, No arguments but returns a value, Recursion.

UNIT IV User Defined Data Types, Structures and Unions**[13 Hours]**

Introduction, Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying and Comparing Structure Variables, Operations on Individual Members, Arrays of Structures, Arrays with Structures, Structures within Structures, Unions. Introduction to Pointers: Introduction and Understanding pointers, accessing the address of a variable, Declaring pointer variables, Initialization of pointer variables, accessing a variable through its pointer. File Management in C: Introduction, Defining and Opening a File, Closing a File, Input/ Output Operations on Files.

Text Books:

1. V. Rajaraman, Neeharika Adabala, “Fundamentals of Computers”, 6th Edition, PHI, 2015. (Chapter 1)
2. R.F Dromey, “How to Solve it by Computer” Pearson, Fourteenth Impression, 2013. (Chapter 1 & 2)
3. E. Balaguruswamy, “Programming In ANSI C”, 3rd edition, McGraw Hill Education , 2006.(Chapter 1 to 12).

References Books:

1. Mahapatra, “Thinking in C”, PHI Publications, 1998.
2. YashwantKanetkar, “Let Us C”, 13th Edition, PHP, 2013.
3. Ashok N. Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 6th Impression , 2009
4. Anami, Angadi, and Manvi, ”Computer Concepts and C Programming – A Holistic approach”, PHI 2008

B20BS1050	OPERATING SYSTEMS AND LINUX FOUNDATION	L	T	P	C
Total Hours: 52		4	0	0	4

COURSE DESCRIPTION:

This course will introduce the core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security. It explores the various tools and techniques commonly used by Linux system administrators and end users to achieve their day-to-day work in a Linux environment.

PRE-REQUISITE:

- This course requires basic C programming skills, knowledge in the operating system, computer

organization, and architecture.

COURSE OBJECTIVES:

- Provide Storage foundational knowledge of Linux
- Provide understanding of Linux operating file system
- Understand and work multiple Linux operating System (RHEL and Ubuntu)
- Enabling Knowledge: the operation, implementation and performance of modern operating systems, and the relative merits and suitability of each for complex user applications
- Throughout the course, practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows, and some instructional operating systems will be studied.

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- Understand the process management policies and scheduling of processes by CPU. Students will be able to understand the basic commands of linux operating system and can write shell scripts
- Describe and analyze the memory management and its allocation policies. Ability to use various Linux commands that are used to manipulate system operations at admin level
- Identify use and evaluate the storage management policies with respect to different storage management technologies.

COURSE CONTENT:

UNIT I Introduction to Operating system

[13 Hours]

Batch Systems, Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems, Operating System Structures, Components & Services, and System calls, System programs, Virtual machines.

Introduction to Linux

Introduction and Installing of Red Hat and Ubuntu Linux Operating System, Interfaces basics like Login, Desktop and Help

UNIT II

[13 Hours]

Process Management: Process Concept, Process Scheduling, Co – Operating process, Threads, Inter process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling, Algorithm evolution.

Interacting With Shell And Desktop : Introduction, Environment, Introduction to Shell , Shell configuration, Secure shell, GNOME, KDE.

UNIT III

[13 Hours]

Memory Management : Logical and Physical address space, Swapping, Contiguous allocation,

Paging, Segmentation, Virtual memory-Demand paging and its performance, Page replacement algorithms, Allocation of frames, thrashing, page size and other considerations.

Basic Linux Administration :Basic System administration, Managing users, Software Management, File System Management, RAID and LVM, Devices and modules, Kernel administration, virtualization, Backup Management, dump/restore.

UNIT IV

[13 Hours]

File management: File Concepts, Access methods, Directory Structure, Protection and consistency, File system structure, Allocation methods, Free space management, Directory Implementation, Recovery.

Linux Network, Security And Services Configuration : Install and configure apache web server, NFS, Mail server, Proxy server, Selinux, firewall, App Armor, NIS, Domain Name System, Samba.

Text Books:

1. Red Hat Fedora Core 7 And Red Hat Enterprise Linux: The Complete Reference Books, McGraw-Hill Education
2. Ubuntu: The Complete Reference Books , Richard Petersen , McGraw-Hill Education
3. Abraham Silberschatz and Peter Baer Galvin, “Operating System Concepts”, 7th Edition, Pearson Education, 2002.
4. “ Operating System” by Gary Nutt, Pearson/Addison Wesley – 2004

Reference Book:

1. A Book by Mark G. Sobell A Practical Guide to Fedora and Red Hat Enterprise Linux, Seventh Edition
2. H.M.Deitel, “Operating Systems”, Pearson Learning Solutions, 3rd Edition, 2003.
3. William Stallings, “Operating Systems”, 6th Edition, Pearson Education, 2010.
4. Stuart, “Operating systems: Principles, Design and Implementation”, 1st Edition 2008, Cengage Learning India

B20BS1060	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

An introductory course that teaches the fundamental concepts of digital logic design and computer organization. Lecture topics include binary numbers, Boolean algebra, logic gates and combinational logic, sequential logic, instruction set architecture, processor organization, caches and virtual memory.

PRE-REQUISITE:

- Elementary knowledge in Electronics and core concept on computer

COURSE OBJECTIVES:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

COURSE OUTCOMES:

After studying this course the students would gain enough knowledge about:

- Understand and examine the structure of various number systems and its Application in digit and the fundamental concepts and techniques used in Digital electronics.
- Design and analyse various combinational and sequential Logic Circuits.
- Understand basic principles on how computers works, how they are designed and their differ architectures
- Identify and compare different methods for computer I/O mechanisms.

COURSE CONTENT:

UNIT I Number systems, Operations, codes and Logic Gates [13 Hours]

Decimal numbers, Binary numbers, Number Base Conversions: Decimal-to-Binary conversion, Binary Arithmetic, 1's and 2's Complements of Binary Numbers, Hexadecimal Numbers, Octal numbers, Binary Coded Decimal (BCD).The Inverter, the AND Gate, the OR gate, the NAND Gate, the NOR Gate, the Exclusive-OR and Exclusive-NOR Gates, Basics of Digital Integrated Circuits

UNIT II Boolean Algebra, Logic Simplification [13Hours]

Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, De Morgan's Theorems, Boolean Analysis of Logic Circuits, Simplification Using Boolean Algebra, Standard Forms of Boolean

Expressions, Boolean Expressions and Truth Tables, The Karnaugh Map, SOP Minimization, POS Minimization.

UNIT III Combinational Logic, Sequential Logic and Basic Structure of Computers [13Hours]

Combinational Logic: Introduction, Design Procedure, Adders, Sequential Logic: Introduction, Flip-Flops. Basic Structure of Computers: Computer types, Functional Units, Basic Operational Concepts, Bus Structures, and Performance and Historical Perspective

UNIT IV Machine Instructions and INPUT/OUTPUT Organization [13Hours]

Memory Locations and Address, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes. INPUT/OUTPUT Organization: Interrupts, Direct Memory Access and Buses.

Text Books:

1. Tokheim “Digital Electronics Principles and Applications”, 6th Edition, McGRAW-HILL, 2015. Chapter 1 (1.1, 1.2, 1.3)
2. THOMOS L. FLOYD, “Digital Fundamentals”, TENTH EDITION, PEARSON, 2014. Chapters (2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10 and 2.11). Chapters (3.1 to 3.7) and (4.1 to 4.9)
3. M. Morris Mano “ Digital Logic and Computer Design”, PEARSON, 2013. Chapters (4.1 to 4.4, 6.1 to 6.2 and 7.1 to 7.3)
4. Hamacher, Vranesic and Zaky, “Computer Organization”, FIFTH EDITION, TATA McGRAW-HILL, 2015. Chapters (1.1, 1.2, 1.3, 1.4 and 1.6) Chapters (4.2, 4.4 and 4.5) Chapters (5.1 to 5.3)

B20BS1070	C PROGRAMMING LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. Program to read and print the size of variables of different data type.
2. A person has deposited some amount in bank. Write a program to calculate simple interest and compound interest on amount for a period.
3. In Delhi, four wheelers run on the basis of even or odd number. Write a program to identify whether vehicle registration number is even or odd.
4. People frequently need to calculate the area of things like rooms, boxes or plots of land where quadratic equation can be used. Write a program to find the coefficients of a quadratic equation and compute its roots.
5. Consider the age of 3 persons in a family, Write a program to identify the eldest person among three of them.

6. Consider student's marks in Computer Test. Write a Program display the grade obtain by student in Computer Test based on range.
7. Calculator allows you to easily handle all the calculations necessary for everyday life with a single application. Write a program to design a basic calculator that performs the basic operations and you want to give choice to user to perform
 - a. Addition of two numbers
 - b. Subtraction of two numbers
 - c. Multiplication of two numbers.
 - d. Division of two numbers.
 - e. Wrong choice
8. In a stock market at the end of the day we do the summation of all the transactions.
9. Write a program to display numbers (transactions) from 1 to n.
10. Write a program to find the sum of n natural numbers.
11. Read your ATM Pin Number. Write a program to identify your Pin Number is palindrome or not
12. Read your Landline Number. Write a program to print the reverse of it and also find sum of digits of your Landline Number.
13. Create a Contact list of n friends, Write a program to read and print the Phone number of your friend's.
14. In computer based applications, matrices play a vital role in the projection of three dimensional image into a two dimensional screen, creating the realistic seeming motions. Write a program to perform matrix Multiplication and check compatibility of matrix.
15. You have joined a startup company of N employees; Write a program is to sort all employee id.
16. A student has taken 10 books from the library. Every time he take's the book, Librarian read's its ISBN Number. Write a program to identify whether book is issued to him or not based on ISBN Number.
17. Suppose students have registered for workshop, and their record is maintained in ascending order based on student id. Write a program to find whether a particular Student has registered for that particular workshop or not
18. In a CCP test you scored less marks compared to your friend, Write a program to swap your marks with your friend.
19. Assume you went to mall to watch movie with your friend. Write a program to interchange your place with a person who is sitting next to your friend.
20. In a memory game, you first enter a string wait for a time and again enter second string, Write a program to check both sting were same or not.
21. Read your first and last name in two different strings; Write a program to combine these two strings into third string. Assume a person has entered a Password, Write a program so that he can know the length of his password.

B20BS1080	LINUX LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. Learn installation procedure of Ubuntu and Red hat Linux server.
2. Create files and directories
3. Change or modify permission on files and directories
4. Install and configure nfs server
5. Configure nfs client and work on mount points
6. Work on Linux desktop interface
7. Configure DNS server
8. Install and configure web server

B20BS1090	ENVIRONMENTAL STUDIES
Total Hours: 30	

COURSE DESCRIPTION:

Environmental studies involves with concepts of natural resources, issues of pollution and the remedial measures, social issues and the laws in place to overcome the issues.

COURSE OBJECTIVES:

The objectives of this course are to:

- To familiarize students with environmental issues as how to conserve, preserve and protect our Environment.

COURSE OUTCOMES:

On successful completion of this course; the student will be able to:

- Analyze the environmental conditions and protect it.
- Observe the role of individual, government and NGO in environmental protection.
- Search for new renewable energy resources with high efficiency through active research.
- Analyze the ecological imbalances and protect it.
- List the causes of environmental pollution & find ways to overcome them.
- Design pollution controlled products.

COURSE CONTENT:

UNIT I Introduction

[07 Hours]

Multidisciplinary nature of environmental studies – Definition -Scope and importance -Need for public awareness.

UNIT II Natural Resources

[08 Hours]

Renewable and non-renewable -Problems associated - Forest resources-Water resources-Mineral resources- Food resources-Energy resources-Land resources and their conservation.

UNIT III Environmental Pollution

[07 Hours]

Definition- Causes - Effects and control measures of air - Water-Soil-Marine-Noise-Thermal – Nuclear Pollutions -Solid waste management-Prevention of pollution.

UNIT IV Social Issues and the Environment

[08 Hours]

Unsustainable to sustainable development, Environmental ethics, Climate changes, global warming, Wildlife protection act, Public awareness- Human Population and the Environment- Population growth- Population explosion - Human rights - Value education - Role of information technology in environment and human health - HIV/Aids -Women and child welfare - Case studies.

Text Books:

1. Desai R.G. - Environmental studies, Himalaya Publication House.

2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,

4. Jadhav, H &Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi.
5. Rao M N. &Datta, A.K. 1987. Waste Water treatment, Oxford & IBH Publ. Co. Pvt. Ltd.

B20BS1100	SKILL DEVELOPMENT PROGRAM
Total Hours:32	

SECOND SEMESTER

S.N O	Code	Title	HC/ SC/ FC	Credit Pattern			Credits	Working Hrs.
				L	T	P		
1	B20BS2011	Language –II Kannada	FC	2	1	0	3	4
	B20BS2012	Language –II Hindi	FC					
	B20BS2013	Language –II Additional English	FC					
2	B20BS2020	Communicative English	FC	2	1	0	3	4
3	B20BS2030	Probability and Statistics	HC	4	0	0	4	4
4	B20BS2040	Cloud Computing and Virtualization Foundation	HC	3	0	1	4	5
5	B20BS2050	Advanced Linux	HC	2	1	0	3	4
6	B20BS2060	Relational Database Management Systems	HC	3	0	1	4	5
7	B20BS2070	Data Structures Using C	HC	2	1	0	3	4
Practical Courses								
8	B20BS2080	Data Structures Lab	HC	0	0	2	2	4
9	B20BS2090	Advanced Linux Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
10	B20BS2100	Constitution of India & Professional Ethics						
11	B20BS2110	Skill Development Program						
Total Credits				18	4	6	28	38

B20BS2011	LANGUAGE –II KANNADA	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

PRE-REQUISITE:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

COURSE OBJECTIVES:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

COURSE OUTCOMES:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

COURSE CONTENT:

Unit – 1: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

[10 Hours]

1. ಗಾನರಾಣಿಯರ ಸಂವಾದ – ರಾಘವಾಂಕ
2. ಸಿಡಲ ಪೊಟ್ಟಣ ಕಟ್ಟಿ ಸೇವಿವ ಕೊಡುವರೆ – ಕುಮಾರವ್ಯಾಸ
3. ಸರ್ವಜ್ಞನ ವಚನಗಳು – ಸರ್ವಜ್ಞ

Unit – 2: ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯ

[10 Hours]

1. ಗಿಳಿಯು ಪಂಜರದೊಳಿಲ್ಲ – ಪುರಂದರದಾಸ
2. ಎಲ್ಲಾರು ಮಾಡುವುದು – ಕನಕದಾಸ
3. ಎಲ್ಲರಂತವನಲ್ಲ ನನಗಂಡ – ಶಿಶುನಾಳ ಶರೀಫ

Unit – 3: ಲೇಖನಗಳು

[10 Hours]

1. ಪೈಪೋಟಿಗೆ ಸಜ್ಜಾಗುತ್ತಿರುವ ದೇಶ – ಎ.ಪಿ.ಜೆ.ಅಬ್ದುಲ್ ಕಲಾಂ
2. ಬಾಪು ಚಿಂತನೆ – ಬಿ ಎ ಶ್ರೀಧರ
3. ಭಾರತ ಸಂವಿಧಾನಕ್ಕೆ 'ಭೂತ' ಚೇಷ್ಟೆ – ದೇವನೂರು ಮಹದೇವ

Unit -4: ಸಂಕೀರ್ಣ ಬರಹ

[09 Hours]

1. ಸಹಜ ಕೃಷಿ – ಪೂರ್ಣ ಚಂದ್ರ ತೇಜಸ್ವಿ

Text Books:

Reference Book:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಚಾರಿತ್ರಿಕ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2008
3. ಸೀಮಾಂತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
4. ಸಂಗ್ರಹ. ನಾಗೇಗೌಡ ಎಚ್.ಎಲ್., ಕನ್ನಡ ಜನಪದ ಕಥನ ಕಾವ್ಯಗಳು, ಪ್ರಕಾಶಕರು ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2007
5. ನಾರಾಯಣ ಪಿ.ವಿ, ಚಂಪೂ ಕವಿಗಳು, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
6. ಕಾಳೇಗೌಡ ನಾಗವಾರ, ತ್ರಿಪದಿ, ರಗಳೆ ಮತ್ತು ಜಾನಪದ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
7. ಸಂ. ಬೆನಗಲ್ ರಾಮ ರಾವ್ ಮತ್ತು ಪಾನ್ಯಂ ಸುಂದರ ಶಾಸ್ತ್ರೀ, ಪುರಾಣ ನಾಮ ಚೂಡಾಮಣಿ, ಪ್ರಕಾಶಕರು ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ. 2010
8. ಡಾ. ಚಿದಾನಂದ ಮೂರ್ತಿ, ವಚನ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013
9. ಸಂ ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ನಾಗರಾಜ ಕಿ.ರಂ. ವಚನ ಕಮ್ಮಟ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
10. ಮರುಳಸಿದ್ದಪ್ಪ ಕೆ, ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2010
11. ಸಂ. ಸೇತುರಾಮ ರಾವ್ ಅ.ರಾ., ಶ್ರೀ ಲಕ್ಷ್ಮೀಶನ ಜೈಮಿನಿ ಭಾರತ(ಮೂಲ-ತಾತ್ಪರ್ಯ-ಸಚಿತ್ರ), ಪ್ರಕಾಶಕರು ಕಾಮಧೇನು ಪುಸ್ತಕ ಭವನ, ಬೆಂಗಳೂರು. 2010
12. ಸಂ. ಸೇತುರಾಮ ರಾವ್ ಅ.ರಾ., ಶಿಶುನಾಳ ಶರೀಫರ ನೂರಾರು ತತ್ವಪದಗಳು, ಪ್ರಕಾಶಕರು ಕಾಮಧೇನು ಪುಸ್ತಕ ಭವನ, ಬೆಂಗಳೂರು. 2007
13. ಸಂ. ಜಿ.ಎಸ್.ಭಟ್., ಕುಮಾರವ್ಯಾಸನ ಕರ್ಣಾಟ ಭಾರತ ಕಥಾಮಂಜರಿ ಪ್ರವೇಶ, ಪ್ರಕಾಶಕರು ಅಕ್ಷರ ಪ್ರಕಾಶನ, ಹೆಗ್ಗೋಡು, ಸಾಗರ. 2006
14. ರಂಜಾನ್ ದರ್ಗಾ, ಶರಣರ ಸಮಗ್ರ ಕ್ರಾಂತಿ, ಪ್ರಕಾಶಕರು. ಲೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಳ್ಳಾರಿ. 2015
15. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
16. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
17. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

B20BS2012	LANGUAGE –II HINDI	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

यह पाठ्यक्रम नौसिखिया, अपनी भाषा की क्षमता का विकास करने हेतु तथा विभिन्न साहित्यिक प्रक्रियाओं द्वारा समाज, संस्कृति एवं जीवन के मूल्यों को समझने हेतु अभिकल्पित है।

PRE-REQUISITE:

- अध्येता, पी.यु.सी के स्तर पर द्वितीय भाषा के रूप में हिन्दी का अध्ययन करना चाहिए।
- हिन्दी साहित्य के इतिहास का संक्षिप्त ज्ञान की आवश्यकता है।
- हिन्दी व्याकरण का अवबोधन आवश्यक है।
- अंग्रेज़ी – हिन्दी अनुवाद से संबंधित जानकारी जरूरी है।

COURSE OBJECTIVES:

1. संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।
2. साहित्य के माध्यम से समाज एवं मानवीय मूल्यों को समझाकर, उन मूल्यों की रक्षा हेतु प्रेरित करना।
3. छात्रों में पुस्तक पठन एवं लेखन की अकृतिम प्रवृत्ति स्थापित करना।
4. अध्येताओं में साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास करना।

COURSE OUTCOMES:

अध्ययन की समाप्ति पर अध्येता –

1. सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है।
2. साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है।
3. समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
4. साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

COURSE CONTENT:

UNIT I

[10 Hours]

- 1 कबीरदास के दोहे – कबीरदास
- 2 कविता – अर्जुन की प्रतिज्ञा - मैथिलीशरण गुप्त
- 3 कविता – वीरों का कैसा हो बसंत – सुभद्रकुमारी चौहान

UNIT II**[10 Hours]**

- 4 तुलसीदास के पद –तुलसीदास
- 5 कविता – संध्या सुंदरी – सूर्यकांत त्रिपाठी 'निराला'
- 6 कविता – करमवीर – अयोध्या सिंह उपाध्याय ' हरिऔध'

UNIT III**[10 Hours]**

- 7 मीराबाई के पद – मीराबाई
- 8 कविता – मधुशाला – हरिवंशराय बच्चन
- 9 कविता – हम झुक नहीं सकते – अतलबिहारी बाजपाई

UNIT IV**[10 Hours]**

अनुवाद अनुच्छेद (हिन्दी से अंग्रेजी)
सृजनात्मक व्यक्तित्व
अ कबीर, महादेवी वर्मा, प्रेमचंद

आ महात्मा गांधी, डॉ बाबासाहेब आंबेडकर, अब्दुल कलाम

सूचना : प्रत्येक इकाई 25 अंक के लिए निर्धारित है ।

Text Books:

- हिन्दी पाठ्य पुस्तक – रेवा विश्वविद्यालय ।

Reference Book:

- 1 सुबोध व्यवहारिक हिन्दी – डॉ. कुलदीप गुप्त
- 2 अभिनव व्यवहारिक हिन्दी – डॉ.परमानन्द गुप्त
- 3 हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
- 4 आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
- 5 हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
- 6 शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
- 7 कार्यालय अनुवाद निदेशिका
- 8 संक्षेपण और पल्लवन - के.सी.भाटिया&तुमन सिंग

B20BS2013	LANGUAGE –II ADDITIONAL ENGLISH	L	T	P	C
Total Hours:40		2	1	0	3

COURSE DESCRIPTION:

This is a 3-credit course designed to help the learner gain competency in language through an exploration to the various genres of literature. The syllabus is designed to encourage critical ability of the learner to guide them towards career opportunities. This course is intended to develop the capacity to appreciate and assess the various dimensions of society, culture and life.

PRE-REQUISITE:

The student must possess fair knowledge of language and literature.

COURSE OBJECTIVES:

- To assess ecological and environmental concerns through literature.
- To identify the unequal structures of power in society.
- To compare the position of men and women in society.
- To interpret the representation of society in popular culture.

COURSE OUTCOMES:

On completion of the course, learners will be able to:

- Demonstrate a thorough understanding of sensitive and critical ecological and environmental issues.
- Analyze the rigid structure of center and margin in our society.
- To criticize the subordinate position of women in society.
- To justify the depiction of society in popular culture.

COURSE CONTENT:

UNIT I Ecology & Environment

Literature: Toru Dutt - Casuarina Tree

[09 Hours]

Robert Frost – Stopping by Woods on a Snowy Evening
Tomas Rivera – The Harvest
C.V. Raman – Water – The Elixir of Life
Language: Degrees of Comparison

UNIT II Voices from the Margin

[10 Hours]

Literature: Tadeusz Rozewicz – Pigtail
Jyoti Lanjewar – Mother
Sowvendra Shekhar Hansda – The Adivasi Will Not Dance
Harriet Jacobs – Excerpt from Incidents in the Life of a Slave Girl
Language: Prefix and Suffix

UNIT III Women & Society

[10 Hours]

Literature: Kamala Das – An Introduction
Usha Navrathnaram – To Mother
Rabindranath Tagore – The Exercise Book
Jamaica Kincaid – Girl
Writing Skills: Dialogue Writing

UNIT IV Popular Culture

[10 Hours]

Literature: Rudyard Kipling – The Absent-minded Beggar
Sir Arthur Conan Doyle – The Hound of the Baskervilles
Aldous Huxley – The Beauty Industry
Writing Skills: Story Writing

Reference Books:

- Agrawal, K.A. Toru Dutt the Pioneer Spirit of Indian English Poetry - A Critical Study. Atlantic Publications, 2009.
- Latham, Edward Connery (ed). The Poetry of Robert Frost. Holt Paperbacks, 2002.
- Gale, Cengage Learning. A Study Guide for Tomas Rivera's The Harvest. Gale, Study Guides, 2017.
- Basu, Tejan Kumar. The Life and Times of C.V. Raman. PrabhatPrakashan, 2016.
- Rozewicz, Tadeusz. New Poems. Archipelago, 2007.
- Manohar, Murli. Critical Essays on Dalit Literature. Atlantic Publishers, 2013.
- Hansda, SowvendraShekhar. The Adivasi Will Not Dance: Stories. Speaking Tiger Publishing Private Limited, 2017.
- Jacobs, Harriet. Incidents in the Life of a Slave Girl. Createspace Independent Publication, 2014.
- Das, Kamala. Selected Poems. Penguin Books India, 2014.
- Tagore, Rabindranath. Selected Short Stories of Rabindranath Tagore. Maple Press, 2012.
- Gale, Cengage Learning. A Study Guide for Jamaica Kincaid's Girl. Gale, Study Guides, 2017.
- Kipling, Rudyard. The Absent-Minded Beggar. Hardpress Publishing, 2013.
- Doyle, Arthur Conan. The Hound of the Baskervilles. General Press, 2017.
- Dixson, Robert J. Everyday Dialogues in English. Prentice Hall India Pvt Ltd., 1988.
- Turton, Nigel D. ABC of Common Errors. Mac Millan Publishers, 1995.
- Samson, T. (ed.) Innovate with English. Cambridge University Press, 2010.
- Kumar, E Suresh, J. Savitri and P Sreehari (ed). Effective English. Pearson Education, 2009.

B20BS2020	COMMUNICATIVE ENGLISH	L	T	P	C
Total Hours: 40		2	1	0	3

COURSE DESCRIPTION:

This 3-credit course focuses on enhancing written proficiency required for professional enhancement. It also polishes the spoken skills of the learners to make them effective and confident presenters. It also addresses the functional aspects of language usage while providing specific linguistic tools through professional language learning software. The practical components discussed in this course enables a fruitful transition from academia to the industry of their choice.

PRE-REQUISITE:

The student must possess functional knowledge of LSRW skills.

COURSE OBJECTIVES:

- To build skills essential for corporate communication.
- To enhance context specific language skills.
- To discover the creative linguistic potential through language and literature.
- To develop communication skills necessary for employability.

COURSE OUTCOMES:

After the completion of the course, students will be able to:

- Apply acquired skills to communicate effectively in a corporate scenario.
- Demonstrate command over rhetoric of language.
- Develop critical and creative thinking through assimilated language skills.
- Utilize the communication skills learnt to match industry standards.

COURSE CONTENT:

UNIT I Language Acquisition

[09 Hours]

Remedial Grammar: Questions & Negatives; Questions Tags

Writing Skills: Email Writing

Activities: Group Discussions

Literature: Alphonse Daudet - The Last Lesson

UNIT II Persuasive Skills

[10 Hours]

Remedial Grammar: Past Simple & Past Perfect

Writing Skills: Report Writing

Activities: Book & Movie Reviews

Literature: Lord Alfred Tennyson – Ulysses

UNIT III Cognitive Skills

[10 Hours]

Remedial Grammar: Present & Past Passive; Conditionals

Writing Skills: Creative Writing

Activities: Role Plays

Literature: O. Henry – The Gift of the Magi

UNIT IV Employability Skills

[10 Hours]

Remedial Grammar: Reported Speech; Idioms

Writing Skills: Cover Letter & CV

Activities: Exchanging Information

Literature: Saki – The Open Window

Reference Books:

1. Bansal, R.K. and J.B. Harrison. Spoken English. Orient Blackswan, 2013.
2. Raman, Meenakshi and Sangeeta Sharma. Technical Communication. Oxford University Press, 2015.
3. Thorpe, Edgar and Showick Thorpe. Objective English. Pearson Education, 2013.
4. Dixson, Robert J. Everyday Dialogues in English. Prentice Hall India Pvt Ltd., 1988.
5. Turton, Nigel D. ABC of Common Errors. Mac Millan Publishers, 1995.
6. Samson, T. (ed.) Innovate with English. Cambridge University Press, 2010.
7. Kumar, E Suresh, J. Savitri and P Sreehari (ed). Effective English. Pearson Education, 2009.
8. Goodale, Malcolm. Professional Presentation. Cambridge University Press, 2013.

B20BS2030	PROBABILITY AND STATISTICS	L	T	P	C
Total Hours: 52		4	0	0	4

COURSE DESCRIPTION:

This course provides an elementary introduction to probability and statistics with applications. Topics include: basic descriptive Statistics, skewness, probability and random variables & mathematical Expectations. Introduces students to the use of computers in statistics, and develops problem solving skills with both theoretical and practical problems.

PRE-REQUISITE:

To start with this course you should have number system and basic abstract algebra

COURSE OBJECTIVES:

To help students understand the basics of probability & statistics

- To acquaint students with various statistical methods.
- To cultivate statistical thinking among students.
- To prepare students for future courses having quantitative components.

COURSE OUTCOMES:

Upon successful completion of the course one should be able to

- Organize, present and interpret statistical data, both numerically and graphically, Create quantitative models to solve real world problems in appropriate contexts
- Compute and interpret the coefficient of Skewness, Correlation and Regression" for bivariate data
- Recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields
- Illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions. Frame problems using multiple mathematical and statistical representations of relevant structures and relationships and solve using standard techniques

COURSE CONTENT:

UNIT I Introduction

[13 Hours]

Meaning of Statistics and its definition-Functions-Scope/Characteristics-limitations. Collection of data Classification of data , preparation of frequency distribution and tabulation of data. Diagrammatic representation of bar and pie diagrams, Graphical representation of median and mode by - histograms, smoothed frequency curve, frequency polygon, Cumulative frequency curves (ogives).Measure of Central Tendency - Arithmetic Mean (Average), Partition values – Median, quartiles, deciles, percentile and Mode and its applications.

UNIT II Measures of Dispersion, and Skewness

[13 Hours]

Methods of Dispersion Range, Quartile deviation, Mean deviations: Standard deviations and Coefficient of Variation and its applications. Measure of skewness: Meaning, uses and problems on Karl Pearson's coefficient of skewness and Bowley's co-efficient of skewness and its applications.

UNIT III Probability**[13 Hours]**

Random experiments, trial, sample space, events. Approaches to probability- classical, empirical, subjective and axiomatic. Theorems on probabilities of events. Addition rules of probability. Conditional probability, independence of events and multiplication rule of probability. Bayes theorem (no proof any theorem) and its applications.

UNIT IV Random variables and Expectations**[13 Hours]**

Definition, Random Variable, Discrete and continuous random variables, Distribution function probability mass and density function problems. Mathematical expectation - discrete random variable and its problems. Joint probability function for pdf, pmf and marginal distribution function of Discrete and Continuous Random Variable simple problems

Text Books:

1. Gupta. S.C and Kapoor V.K. Fundamentals of Mathematical Statistics, Sultan Chand and sons, (2001)
2. Freund J.E., Mathematical Statistics, Prentice hall, (2001)

Reference Books:

1. Berenson and Levine, Basic Business Statistics, Prentice- Hall India (1996, 6thedition)
2. S.P.Gupta, "Statistical methods"- Sultan Chand & Sons, New Delhi, latest Edition
3. Ross Sheldon, A First Course in Probability, Macmillan , (6th edition)
4. Medhi.J, "Statistical methods - An introductory text", new age publications, 2009 edition.
5. D.C. Montgomery and G.C.Runger, "Applied Statistics and Probability for engineers", New Jersey, John Wiley and Sons, 3rd edition, 2003.
6. P K Srimani and M Vinayaka Murthy, "Probability and Statistics", Subhas Stores, 2000.

B20BS2040	CLOUD COMPUTING AND VIRTUALIZATION FOUNDATION	L	T	P	C
Total Hours: 52		3	0	1	4

COURSE DESCRIPTION:

This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models. The course also covers the Cloud security model and associated challenges and delves into the implementation and support of High Performance Computing and Big Data support capabilities on the Cloud.

PRE-REQUISITE:

- To start learning cloud computing one should have better knowledge in operating system, Networking, and coding skills

COURSE OBJECTIVES:

The objective of this course is to:

- Provide storage foundation knowledge on Cloud Computing concepts

- Demystify cloud and virtualization
- Understand multiple Hypervisors/Virtualization technologies used in cloud data centre with hands on experience
- Ability to Install and configure Microsoft hyper infrastructure
- Ability to Install and manage Windows server 2016.

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Understand basics of virtualization
- Understand what is Cloud Computing and its business case
- Understand Cloud Types ,Cloud Service Deployment Models (IaaS*, PaaS*, SaaS*) Private ,Public and Hybrid Cloud Computing
- Design and implement Microsoft virtualization on windows 2016 server and Learn How to Create Virtual Machines (VM) using Hypervisors & how to choose a right service provider

COURSE CONTENT:

UNIT I Virtualization basics

[13 Hours]

Evolution of virtualization, Virtualization basics, types of virtualization Full virtualization and Para virtualization Virtual box installation and create virtual machine, install Ubuntu and centos Linux in virtual machine, KVM Installation and Create virtual machines on KVM hypervisor.

UNIT II Cloud Computing foundation

[13 Hours]

Understanding cloud computing, characteristics of Cloud computing, basic concepts and terminologies, benefits and limitations of Cloud computing, Cloud infrastructure framework, the business case of going cloud.

UNIT III Cloud Computing Service & Deployment Models

[13 Hours]

Understand cloud computing service models Infrastructure-As-A-Service, Platform-As-A-Service, Software-As-A-Service, Storage-As-A-Service and also Understand Cloud Deployment models like Private cloud, Public Cloud, Hybrid cloud, and community cloud, Introduction to Cloud Computing Security whitepaper “Nine Notorious threats in Cloud Computing Cloud Security Alliance

UNIT IV Microsoft Windows server latest with Hyper-v Virtualization

[13 Hours]

Microsoft 2016 server Introduction and installing web server, nfs, cifs ,dns role, Active directory ,iSCSI role on windows server, Learning Power shell, Hyper-V Basics , Hyperv-v virtual machine operations, Hyper Networking, Hyper storage, Building a Failover Cluster,

Text books:

1. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More by Kris Jamsa
2. Mastering Windows Server 2016 Jordan Krause by October 2016

Reference Book:

1. Windows Server 2016 Hyper-V Cookbook - Second Edition, Charbel Nemnom, Patrick Lownds.

B20BS2050	ADVANCED LINUX	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

This course provided students with the fundamental concepts of Linux/UNIX operating systems. The course covers such topics as the Linux/UNIX file system, commands, utilities, text editing, shell programming and text processing utilities. Students learn command line syntax and features of the popular Linux/UNIX shells.

PRE-REQUISITE:

- Basic knowledge on Operating Systems, their functionalities and Unix/Linux basic commands and Shell script.

COURSE OBJECTIVES:

The objective of this course is to:

- Understand advanced topics of Linux operating system
- Understand Linux troubleshooting
- Automating Linux common and advanced tasks using scripting

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Demonstrate a basic knowledge of working with Linux and Communicate using multiple modes of communication
- Evaluate and apply technology resources by installing, configuring, and managing a Linux server and relevant services and applications.
- Understand the importance of maintaining a secure Linux server
- Ability to understand troubleshooting steps in Linux, write scripts and execute them

COURSE CONTENT:

UNIT I Configuring Server on Linux:

[13 Hours]

Configure web server and securing your web traffic using SSL, troubleshooting web server, Configure FTP server and ftp client, configure windows file sharing Samba server, Configuring NFS Server

UNIT II Linux scripting :

[13 Hours]

The Bourne Again Shell (bash), background of scripting Writing Simple Shell Scripts, Executing and debugging shell scripts Understanding shell variables , Special shell positional parameters ,Reading in

parameters ,Parameter expansion in bash ,Performing arithmetic in shell scripts ,Using programming constructs in shell scripts ,The “if . . . then” statements ,The case command ,The “for . . . do” loop ,The “while . . . do” and “until . . . do” loops, Trying some useful text manipulation programs ,The general regular expression parser ,Remove sections of lines of text (cut) ,Translate or delete characters (tr) The stream editor (sed) ,Using simple shell scripts ,setting up CRON job, Backup script

UNIT III Linux Networking and Linux advanced administration

[13 Hours]

Network Administration Ubuntu and Centos (Configure DNS,DHCP, routes, work with network interface and network files, Linux Administration (Starting and stopping services, understand working with logs, working with LVM , Software package management like apt-get on Ubuntu and yum for centos. Monitoring (understanding and working logs, centralizing the logs)

UNIT IV Linux troubleshooting and security

[13 Hours]

Security (understand basic security in linux, securing user accounts, securing passwords, securing the file system, monitoring user accounts and fiel system, introduction to implementing Linux security with cryptography , Enhanced linux security, securing Linux on network . Troubleshooting (Bios setup troubleshooting, troubleshooting init process, rescue mode and troubleshooting memory issues. Managing Processes (listing processes, background foreground process, killing processes, introduction PID Namespaces)

Text books:

1. Your Unix the ultimate Guide by Sumitabha Das
2. Linux Bible, 8th Edition Christopher Negus, Christine Bresnahan (Contributions by) ISBN: 978-1-118-21854-9
3. Practical Guide to Ubuntu Linux ,A, 4/E by Mark G. Sobell

B20BS2060	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Total Hours: 52		3	0	1	4

COURSE DESCRIPTION:

The course reviews topics such as conceptual data modeling, relational data model, relational query languages, relational database design. This course helps to understand the basic concepts of DBMS. To show how they are realized in specific systems such as the SQL by giving some hands-on experience in using DBMS.

PRE-REQUISITE:

- Before learning the DBMS, you must have the basic knowledge of Database.

COURSE OBJECTIVES:

- To introduce the basic concepts in Database Systems and Relational Databases.
- To expose the students to the steps in building E-R Diagrams and Normalization.
- To train the students in the practical skills using Oracle9i software to develop and alter tables.
- To equip the students with skills to manipulate tables using updation, deletion and arithmetic operations.
- To provide the basic understanding to group data using built-in functions and join multiple tables.

COURSE OUTCOMES:

- Understanding basic concepts of Database Systems and relate the knowledge of mathematical operations in databases.
- Analyze and design relational schema using ER modelling and Normalization.
- Understanding the various features of Oracle 9i software tool and programming the various database languages.
- Applying the knowledge of databases languages to find the solutions for real world database related applications.

COURSE CONTENT:

UNIT I Introduction

[13 Hours]

Database System Applications – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Databases Design – Data Storage and Querying – Transaction Management – Database Architecture – Database Users and Administrator.

Relational Model: Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations.

UNIT II Database Design

[13 Hours]

Overview – Entity-Relationship Model – Constraints – Removing Redundant Attributes – E-R Diagrams – Reduction to Relational Schemas – E-R Design Issues – Extended E-R Features.

Relational Database Design: Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition using Functional Dependencies – Functional-Dependency Theory – Algorithms for Decomposition – Decomposition using Multivalued Dependencies – More Normal Forms.

UNIT III Oracle9i

[13 Hours]

Overview, Personal Databases – Client/Server Databases – Oracle9i an introduction – SQL *Plus Environment – SQL – Logging into SQL *Plus - SQL *Plus Commands – Errors & Help – Alternate Text Editors - SQL *Plus Worksheet - iSQL *Plus.

Oracle Tables: DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information – Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types – Spooling – Error codes.

UNIT IV Working with Table

[13 Hours]

Data Management and Retrieval: DML –adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table – Arithmetic Operations – restricting Data with WHERE clause – Sorting – Revisiting Substitution Variables – DEFINE command – CASE structure.

Functions and Grouping: Built-in functions – Grouping Data. Multiple Tables: Join – Set operations.

Text Books:

1. Database System Concepts – Abraham Silberschatz, Henry F. Korth and S. Sudarshan, 6th Edition, McGraw-Hill. (Units 1 and 2)
2. Database Systems Using Oracle – Nilesh Shah, 2nd edition, PHI. (Units 3 and 4)

Reference Books:

1. Database Management Systems – ArunMajumdar&Pritimoy Bhattacharya, 2007, TMH.
Database Management Systems – Gerald V. Post, 3rd edition, TMH.

RDBMS LAB

Practical List - 1

1. Create the following Tables and Insert the below data.

Salesmen

SNUM	SNAME	CITY	COMMISSION
1001	Piyush	London	12 %
1002	Sejal	Surat	13 %

1004	Miti	London	11 %
1007	Rajesh	Baroda	15 %
1003	Anand	New Delhi	10 %

SNUM : A unique number assigned to each salesman.

SNAME : The name of salesman.

CITY : The location of salesmen.

COMMISSION: The Salemen's commission on orders.

Customers

CNUM	CNAME	CITY	RATING	SNUM
------	-------	------	--------	------

2001	Harsh	London	100	1001
2002	Gita	Rome	200	1003
2003	Lalit	Surat	200	1002
2004	Govind	Bombay	300	1002
2006	Chirag	London	100	1001
2008	Chinmay	Surat	300	1007
2007	Pratik	Rome	100	1004

CNUM : A unique number assigned to each customer.

CNAME : The name of the customer.

CITY : The location of the customer.

RATING : A level of preference indicator given to this customer.

SNUM : The number of salesman assigned to this customer.

Orders

ONUM	AMOUNT	ODATE	CNUM	SNUM
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3001	18.69	10/03/97	2008	1007
3003	767.19	10/03/97	2001	1001
3002	1900.10	10/03/97	2007	1004
3005	5160.45	10/03/97	2003	1002
3006	1098.16	10/03/97	2008	1007
3009	1713.23	10/04/97	2002	1003
3007	75.75	10/04/97	2004	1002
3008	4723.00	10/05/97	2006	1001
3010	1309.95	10/06/97	2004	1002
3011	9891.88	10/06/97	2006	1001

ONUM : A unique number assigned to each order.

AMOUNT : The amount of an order.

ODATE : The date of an order.

CNUM : The number of customer making the order.

SNUM : The number of salesman credited with the sale.

Practical List - 2

- 1) Alter salesman table by setting snum as primary key.
- 2) Alter customer table by setting cnum as primary key.
- 3) Alter orders table by setting onum as primary key.
- 4) Alter orders table by adding snum and cnum as foreign keys
- 5) Alter customer table by adding snum as foreign keys
- 6) Insert any five records in customers table.

- 7) Update the name of the customer in the customers table from Lalit to Girish
- 8) Remove all orders from customer Chirag from the orders table.

Practical List - 3

1. Produce the order no, amount and date of all orders.
2. Give all the information about all the customers with salesman number 1001.
3. Display the following information in the order of city, sname, snum and commission.
4. List of rating followed by the name of each customer in Surat.
5. List of all orders for more than Rs. 1000.
6. List all customers whose names begins with letter 'A' to 'G'.
7. List of names and cities of all salesmen in London with commission above 10%.
8. List all customers excluding those with rating ≤ 100 unless they are located in Rome.
9. List all orders for more than Rs.1000 except the orders of snum < 1006 of 10/03/97.
10. List all orders with zero or NULL amount.

Practical List - 4

- 1) Display cnum, cname, city from customer details table.
- 2) Display all snum without duplicates from all orders.
- 3) Display names and commissions of all salespeople in london.
- 4) All customers who were either located in Rome or had a rating above 200.
- 5) All customers with NULL values in city column.
- 6) All orders taken on Oct 3rd and Oct 4th 1997.
- 7) Largest order taken by each salesperson with order value more than \$3000.
- 8) Select each customer's smallest order.
- 9) Count the number of salespeople currently listing orders in the order table.
- 10) All customers serviced by Piyush or Miti.

Practical List - 5

Solve the following using PL/SQL Block.

- 1) Reverse of a Number
- 2) Factorial of a number
- 3) Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.
- 4) Write a PL/SQL to split the student table into two tables based on result (One table for —Pass and another for —Fail). Use cursor for handling records of student table. Assume necessary fields and create a student details table.

B20BS2070	DATA STRUCTURES USING C	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

In this course will explore several fundamental algorithms and data structures and learn to implement them in C. Some of the data structures we will encounter include linked lists, stacks, queues, trees, heaps, hash tables, and graphs. Study and analyze algorithms for searching, traversing trees, hashing, manipulating priority queues, sorting, finding shortest paths in graphs, and much more.

PRE-REQUISITE:

- To get started with Data Structures you should be familiar with the Basics of Programming Languages and better knowledge in Logic building skills

COURSE OBJECTIVES:

- Assess how the choice of data structures and algorithm design methods.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Write programs using function-oriented design principles.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

COURSE OUTCOMES:

On successful completion of this course, the student is expected to be able to:

- Understands the importance of Data structures.
- Design or select an appropriate data structures for a particular problem,
- Apply their knowledge of data structures in writing more efficient programs in a programming language,
- Develop Applications using Linear and Non-Linear Data Structures.

COURSE CONTENT:

UNIT I Basics of Data Structures

[13Hours]

Definition of algorithm, Characteristics of algorithm , algorithm analysis, algorithm complexity, Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays- Inserting and deleting operations, String operations, Structures, Unions, Pointers and Dynamic Memory Allocation Functions.

UNIT II Linear Data Structures

[13 Hours]

Stack: Definition, Array representation, Operations, Recursion, Towers of Hanoi, Applications of stack (Infix to postfix conversion, evaluation of expression). Queue: Definition, representation, Operations, Applications; Types of queues: Simple queue, Circular queue, Double ended queue, Priority queue.

UNIT III Linked List

[13 Hours]

Definition, singly linked list: Representation in memory, Traversing, Insertion, Deletion and Searching; Doubly linked list; Header linked list; Circular linked list. **Divide and Conquer:** Linear and Binary Search. **Sorting:** Insertion, Selection, Bubble, Quick, Merge. **Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

UNIT IV Non Linear Data Structures

[13Hours]

Need for non-linear structures, Trees and its representation, Binary Tree, Types of Binary Trees, Binary tree traversals , applications of trees , Binary Search Tree, Introduction to Graph, Graph Traversal Techniques, 0/1-knapsack.

Text Books:

1. Ashok N Kamthane, "Introduction to Data Structures in C", Pearson Education (S) Pvt Ltd., New Delhi: 2005. – (Chapter 1to 11)
2. YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbanum, "Data Structures Uisng C and C++", 2nd Edition, Pearson Education Asia, 2002. – (Chapter 1 to 8)

Reference Books:

1. Jean-Paul Tremblay and Paul G Sorenson, "An Introduction to Data Structures with Applications", Second Edition, Tata McGraw-Hill Publishing Company Lt., New Delhi: 1995.
2. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), Fundamentals of Data Structure in C, 2nd Edition, University Press, India.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education.
4. E. Balaguruswamy, "Data Structures using C", McGraw Hill Edition India Pvt. Ltd, 2013

B20BS2080	DATA STRUCTURES LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. Design, Develop and Implement a menu driven Program in C for the following Array operations
 - a. Creating an Array of N Integer Elements
 - b. Display of Array Elements with Suitable Headings
 - c. Inserting an Element (ELEM) at a given valid Position (POS)
 - d. Deleting an Element at a given valid Position(POS)
 - e. Exit.

Support the program with functions for each of the above operations.

2. Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)
 - a. Push an Element on to Stack
 - b. Pop an Element from Stack
 - c. Demonstrate how Stack can be used to check Palindrome
 - d. Demonstrate Overflow and Underflow situations on Stack
 - e. Display the status of Stack
 - f. Exit

Support the program with appropriate functions for each of the above operations

3. Design, Develop and Implement a menu driven Program in C for the following operations on QUEUE of Integers (Array Implementation of Stack with maximum size MAX)
 - a. Insert an Element on to queue
 - b. Delete an Element from queue
 - c. Demonstrate Overflow and Underflow situations on Queue.
 - d. Display the status of Queue.
 - e. Exit

Support the program with appropriate functions for each of the above operations

4. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the

operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.

5. Design, Develop and Implement a Program in C for the following Stack Applications

- a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
- b. Solving Tower of Hanoi problem with n disks

6. Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX)

- a. Insert an Element on to Circular QUEUE
- b. Delete an Element from Circular QUEUE
- c. Demonstrate Overflow and Underflow situations on Circular QUEUE
- d. Display the status of Circular QUEUE
- e. Exit

Support the program with appropriate functions for each of the above operations

7. Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo

- a. Create a SLL of N Students Data by using front insertion.
- b. Display the status of SLL and count the number of nodes in it.
- c. Perform Insertion / Deletion at Front of SLL(Demonstration of stack)
- d. Perform rear insertion/ deletion at front of SLL(Demonstration of Queue)
- e. Exit

8. Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo

- a. Create a DLL of N Employees Data by using end insertion.
- b. Display the status of DLL and count the number of nodes in it
- c. Perform Insertion and Deletion at End of DLL
- d. Perform Insertion and Deletion at Front of DLL
- e. Exit

9. Simulate the working of a circular linked list providing the following operations

- a. Delete from the beginning
- b. Delete from the end
- c. Delete a given element
- d. Display
- e. exit

Insert is mandatory.

10. Implement quick sort.

11. Implement the search techniques of

- a. Linear Search using iteration
- b. Binary Search using recursion.

12. Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers

- a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2
- b. Traverse the BST in Inorder, Preorder and Post Order
- c. Search the BST for a given element (KEY) and report the appropriate message
- d. Exit

13. Write a C program to traverse the nodes in a graph using i. Breadth First Search. ii. Depth First Search.

14. Write a Program to

- a) Create AVL Tree
- b) Insert element to AVL tree
- c) Find the height of the AVL tree

B20BS2090	ADVANCED LINUX LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. Configure web server security for access over https
2. Configure ftp server
3. Configure samba server
4. Write a workable scripts to install web server
5. Write scripts to install MySQL- database server
6. Write scripts to check if ,if else based parameters
7. Setup cron job
8. Work with system logs and service logs
9. Manage system processes
10. Troubleshooting issues with memory and init process.

B20BS2100	CONSTITUTION OF INDIA & PROFESSIONAL ETHICS
Total Hours: 40	

COURSE OBJECTIVES:

- To provide and gain knowledge on Constitution of India
- To know and understand about the Fundamental Rights, Duties and other Rights which is been given by our law.
- To prepare students in the practicality of Constitution perspective and make them face the world as abona fide citizen.
- To attain knowledge about ethics and also know about professional ethics.
- To explore ethical standards followed by different companies.

COURSE OUTCOMES:

On successful completion of this course; the student shall be able to:

- Strengthen the knowledge on Indian constitutional law and make the practical implementation of it.
- Understand the fundamental rights and human rights.
- Get the knowledge to explain the duties and more importantly practise it in a right way.
- Adopt the habit of raising their voice against a non constitutionality of any laws and upon any legal discrimination as we have session of debates on Constitutional validity.
- Get exposed about professional ethics and know about etiquettes about it.

- Know about ethical standards of different companies which will increase their professional ability.

COURSE CONTENT:

UNIT I Constitution of India

[10 Hours]

Definition, Making of Indian Constitution, Preamble to the Constitution of India, Fundamental Rights under Part III; Rights to Equality, Right to Freedom, Right against Exploitation, Rights to Freedom of Religion, Cultural and Educational Rights, Constitutional Remedies. Fundamental Duties of the Citizen, Significance and Characteristics. Elements of National Significance; National Flag, National Anthem, National Emblem.

UNIT II Union and State

[10 Hours]

Organs of the Government; Legislature, Executive and Judiciary .Union and State Executives: President Vice President, Prime Minister, Supreme Court, Cabinet, Governor, Council of Ministers, Electoral process, Election Commission. Right to Information (RTI), Consumer and Consumer Protection.

UNIT III Ethics

[10 Hours]

Meaning, Definition, Evolution, Need of ethics, Aristotle an Ethics, Utilitarianism, Kantianism, Professional ,Ethics, Personal Ethics and Business Ethics, Ethical Standards, Duties of Employers and Employees.

UNIT IV Engineering Ethic

[10 Hours]

Definition Scope and needs, Ethics in Consumer Protection, Due Care theory, Environmental Ethics, Ethical Code of Conduct in ethics. Best Ethical Companies in India and Abroad; Corporate Social Responsibilities, Code of Conduct and Ethical Excellence.

Text book:

1. M V Pylee, An introduction to Constitution of India

B20BS2110	SKILL DEVELOPMENT PROGRAM
Total Hours: 32	

THIRD SEMESTER

S.N O	Code	Title	H C/ SC /F C	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS3011	Language –III Kannada	FC	2	0	0	2	2
	B20BS3012	Language –III Hindi						
	B20BS3013	Language –III Additional English						
2	B20BS3020	Cloud Computing Architecture and Design	HC	2	1	0	3	4
3	B20BS3030	Computer Networks	HC	3	1	0	4	5
4	B20BS3040	Data mining & Data warehousing	HC	4	0	0	4	4
5	B20BS3050	Python Foundation	HC	3	0	0	3	3
6	B20BS3061	Advanced Virtualization Concepts	SC	3	0	0	3	3
	B20BS3062	Linear Algebra						
	B20BS3063	E-Commerce						
Practical Courses								
7	B20BS3070	Cloud Computing Architecture and Design Lab	HC	0	0	2	2	4
8	B20BS3080	Python Foundation Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								

9	B20BS3090	Soft skills				
10	B20BS3100	Skill Development Program				
Total Credits		17	2	4	23	29

B20BS3011	LANGUAGE –III KANNADA	L	T	P	C
Total Hours: 26		2	0	0	2

COURSE DESCRIPTION:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

PRE-REQUISITE:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

COURSE OBJECTIVES:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

COURSE OUTCOMES:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

COURSE CONTENT:

Unit – 1: ನವೋದಯ ಕವಿತೆಗಳು**[07 Hours]**

- | | |
|-----------------------|----------------|
| 1. ಇಳಿದು ಬಾ ತಾಯೆ | - ದ.ರಾ.ಬೇಂದ್ರೆ |
| 2. ದೇವರು ರುಜು ಮಾಡಿದನು | - ಕುವೆಂಪು |
| 3. ನನ್ನ ನಲ್ಲ | - ಮಧುರಚೆನ್ನ |

Unit – 2: ನವ್ಯ ಕವಿತೆಗಳು**[07 Hours]**

- | | |
|------------------------------------|-----------------------|
| 1. ನೆಲ ಸಪಾಟಿಲ್ಲ | - ಗೋಪಲಕೃಷ್ಣ ಅಡಿಗ |
| 2. ಇಡದಿರು ನನ್ನ ನಿನ್ನ ಸಿಂಹಾಸನದ ಮೇಲೆ | - ಕೆ.ಎಸ್.ನರಸಿಂಹಸ್ವಾಮಿ |
| 3. ಅವ್ವ | - ಪಿ. ಲಂಕೇಶ್ |

Unit –3: ವಾಣಿಜ್ಯ ಕನ್ನಡ ವೈಜ್ಞಾನಿಕ ಲೇಖನಗಳು**[06 Hours]**

- | | |
|---|-------------------------|
| 1. ಅತಿ ಸಣ್ಣ, ಸಣ್ಣ ಪ್ರಮಾಣದ ಉದ್ಯಮಗಳು ಹಾಗೂ ವಿಶೇಷ ಆರ್ಥಿಕ ವಲಯ (ಎಸ್.ಇ.ಝೆಡ್) | - ಮುರುಳೀಧರ ಬಿ. ಕುಲಕರ್ಣಿ |
| 2. ಮೊಬೈಲ್ ಬ್ಯಾಂಕಿಂಗ್ ಬಲು ಸುಲಭ | - ಮಹೇಶ್ ಚಂದ್ರ |
| 3. ವಿಜ್ಞಾನ ಮತ್ತು ಧರ್ಮ | - ಡಾ. ಜಿ. ರಾಮಕೃಷ್ಣ |

Unit -4: ಏಕಾಂಕ**[06 Hours]**

- | | |
|------------|------------------|
| 1. ಮಾನಿಷಾದ | - ಗಿರೀಶ್ ಕಾರ್ನಡ್ |
|------------|------------------|

Text Books:**Reference Book:**

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
4. ಡಾ. ಈ.ಎಸ್. ಅಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
5. ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್., ಬೇಂದ್ರೆ ಶರೀಫರ ಕಾವ್ಯಾಯಾನ, ಪ್ರಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
6. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
7. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
8. ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವಕರ್ನಾಟಕ ಪಬ್ಲಿಕೇಷನ್ಸ್ ಪ್ರೈವೇಟ್ ಲಿಮಿಟೆಡ್. 2010

9. ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004
10. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013

B20BS3012	LANGUAGE –III HINDI	L	T	P	C
Total Hours: 26		2	0	0	2

COURSE DESCRIPTION:

ಯಹ ಪಾಠ್ಯಕ್ರಮ ನೌಸಿಖಿಯಾ, ಅಪನಿ ಭಾಷಾ ಕೀ ಕ್ಷಮತಾ ಕಾ ವಿಕಾಸ ಕರನೇ ಹೇತು ತಥಾ ವಿಭಿನ್ನ ಸಾಹಿತ್ಯಿಕ ಪ್ರಕ್ರಿಯಾಂ ದ್ವಾರಾ ಸಮಾಜ, ಸಂಸ್ಕೃತಿ ಂವ ಜೀವನ ಕೇ ಮೂಲ್ಯೋ ಕೋ ಸಮಜ್ಜನೇ ಹೇತು ಅಭಿಕಲ್ಪಿತ ಹೈ |

PRE-REQUISITE:

- ಅಧ್ಯೇತಾ, ಪಿ.ಯು.ಸಿ ಕೇ ಸ್ತರ ಪರ ದ್ವಿತ್ಯಿ ಭಾಷಾ ಕೇ ರೂಪ ಮೆಂ ಹಿನ್ದಿ ಕಾ ಅಧ್ಯಯನ ಕರನಾ ಚಾಹಿಁ |
- ಹಿನ್ದಿ ಸಾಹಿತ್ಯ ಕೇ ಇತಿಹಾಸ ಕಾ ಸಂಕ್ಷಿಪ್ತ ಜ್ಞಾನ ಕೀ ಆವಶ್ಯಕತಾ ಹೈ |
- ಹಿನ್ದಿ ವ್ಯಾಕರಣ ಕಾ ಅವಬೋಧನ ಆವಶ್ಯಕ ಹೈ |

- अंग्रेज़ी – हिन्दी अनुवाद से संबंधित जानकारी जरूरी है।

COURSE OBJECTIVES:

- संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।
- साहित्य के माध्यम से समाज एवं मानवीय मूल्यों को समझाकर, उन मूल्यों की रक्षा हेतु प्रेरित करना।
- छात्रों में पुस्तक पठन एवं लेखन की अकृतिम प्रवृत्ति स्थापित करना।
- अध्येताओं में साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास करना।

COURSE OUTCOMES:

अध्ययन की समाप्ति पर अध्येता –

- सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है।
- साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है।
- समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
- साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

COURSE CONTENT:

UNIT I

[07 Hours]

नाटक -आधे – अधूरे - मोहन राकेश
नाटक विधा का परिचय
आधे – अधूरे - प्रथम अंक

UNIT II

[07 Hours]

नाटक -आधे – अधूरे - मोहन राकेश
आधे – अधूरे - द्वितीय अंक

UNIT III

[06 Hours]

नाटक -आधे – अधूरे - मोहन राकेश
आधे – अधूरे - तृतीय अंक

UNIT IV

[06 Hours]

नगदी रहित व्यवहार

- | | | |
|---|---|---|
| अ | 1 | चेक तथा बैंक प्रणाली द्वारा भुगतान |
| | 2 | कम्प्यूटर इंटरनेट प्रणाली द्वारा भुगतान |
| आ | 3 | स्वैप (POS) मशीन द्वारा भुगतान |
| | 4 | भ्रमणध्वनि द्वारा भुगतान |

इ 5 एटीएम द्वारा भुगतान
6 विभिन्न बैंकों के एप द्वारा भुगतान
सूचना : प्रत्येक इकाई 25 अंक के लिए निर्धारित है ।

Text Books:

- नाटक -आधे – अधूरे - मोहन राकेश

Reference Book:

1. हिन्दी नाटक उद्भव और विकास –दशरथ ओझा
2. हिन्दी साहित्य का इतिहास – डॉ.नागेन्द्र
3. आधुनिक हिन्दी साहित्य का इतिहास डॉ. बच्चन सिंह
4. हिन्दी साहित्य का नवीन इतिहास – डॉ. लालसाहब सिंह
5. शुद्ध हिन्दी कैसे बोले कैसे लिखे – पृथ्वीनाथ पांडे
6. हिन्दी नाटक और रंगमंच – डॉ.रामकुमार वर्मा
7. कंप्यूटर सूचना प्रणाली विकास – रामबंसल वाज्ञाचर्या
8. कंप्यूटर के भाषिक अनुपयोग - विजयकुमार मल्होत्रा

B20BS3013	LANGUAGE-III ADDITIONAL ENGLISH	L	T	P	C
Total Hours: 26		2	0	0	2

COURSE DESCRIPTION:

This 2-credit course allows the learners to explore the various socio-political aspects represented in literature. The concepts discussed in the course provide learning exposure to real life scenarios. The course is designed to develop critical thinking ability among learners, through the socio-political aspects discussed in literature. Thus, the aim is to produce responsible and sensitive individuals.

PRE-REQUISITE:

The student must possess fair knowledge of language, literature and society.

COURSE OBJECTIVES:

- To outline the global and local concerns of gender and identity.
- To identify the complexities of human emotions through literature.
- To assess the struggles of human survival throughout history.
- To compare and contrast between the various dimensions of childhood.

COURSE OUTCOMES:

On completion of the course, learners will be able to:

- Evaluate the pressing gender issues within our society.
- Criticize human actions through a humane and tolerant approach.
- Perceive the human conflicts with an empathetic perspective.
- To disprove the assumption of a privileged childhood.

COURSE CONTENT:

UNIT I Gender & Identity

[06 Hours]

Anne Sexton – Consorting with Angels

Eugene Field – The Doll’s Wooing

Vijay Dan Detha – Double Life

Charlotte Perkins Gilman – The Yellow Wallpaper 12 Hours

UNIT II Love & Romance

[06 Hours]

Alfred Noyes – The Highway Man

William Shakespeare – Sonnet 116

Frank Richard Stockton – The Lady or the Tiger?

Oscar Wilde – The Nightingale and the Rose

UNIT III War & Trauma

[07 Hours]

Lord Alfred Tennyson – The Charge of the Light Brigade

TaufiqRafat – The Medal

Guy de Maupassant – Two Friends

Sadaat Hasan Manto – Toba Tek Singh

UNIT IV Children's Literature**[07 Hours]**

William Blake – The Chimney Sweeper
 D.H. Lawrence – Discord in Childhood
 Anna Sewell – The Black Beauty (Extract)
 Rudyard Kipling – The Jungle Book (Extract)

Reference Books:

1. Sexton, Anne. The Complete Poems. Houghton Mifflin, 1999.
2. Namjoshi, Suniti. Feminist Fables. Spinifex Press, 1998.
3. Vanita, Ruth & Saleem Kidwai (ed.) Same Sex Love in India. Penguin India, 2008.
4. Gilman, Charlotte Perkins. The Yellow Wallpaper. Rockland Press, 2017.
5. Gale, Cengage Learning. A Study Guide for Alfred Noyes's "The Highwayman". Gale, Study Guides, 2017. (Kindle Edition Available)
6. Shakespeare, William. Poems and Sonnets of William Shakespeare. Cosimo Classics, 2007.
7. Stockton, Frank Richard. The Lady, or the Tiger? Create space Independent Publications, 2017.
8. Wilde, Oscar. The Collected Works of Oscar Wilde. Wordsworth Editions Ltd., 1997.
9. Tennyson, Lord Alfred. The Complete Works of Alfred Tennyson. Forgotten Books, 2017.
10. Blake, William Erdman, David V. (ed.). The Complete Poetry and Prose (Newly revised ed.). Anchor Books, (1988).
11. Maupassant, Guy de. Guy de Maupassant-The Complete Short Stories. Projapati, 2015.
12. Manto, Sadaat Hasan. Manto: Selected Short Stories. RHI, 2012.
13. Ricks, Christopher. Metaphysical Poetry. Penguin, 2006.
14. Sewell, Anna. The Black Beauty. Maple Press, 2014.
15. Kipling, Rudyard. The Jungle Book. Amazing Reads, 2018.

B20BS3020	CLOUD COMPUTING ARCHITECTURE AND DESIGN	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

The course covers the Cloud security model and associated challenges and delves into the implementation and support of High Performance Computing and Big Data support capabilities on the Cloud. This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models.

PRE-REQUISITE:

- To start learning cloud computing one should have better knowledge in Virtualization concepts, operating system, Networking, and coding skills

COURSE OBJECTIVES:

- Get understanding of Cloud Data center Infrastructure framework
- Understand components which help achieve cloud infrastructure

COURSE OUTCOMES:

- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player, Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability and design Cloud Services and Set a private cloud

COURSE CONTENT:

UNIT I Cloud computing architecture and design : [13 Hours]

Virtual data centre concepts, Cloud data centre concepts, cloud data centre building blocks , like cloud virtualization, cloud networking, cloud storage ,cloud databases , Cloud self service portal . Cloud management software introduction – Openstack, Cloudstack, Microsoft system centre , VMware cloud management software.

UNIT II Hybrid cloud architecture [13 Hours]

Introduction to hybrid cloud architecture, on-premise to public cloud (hrbrid architecture) AWS and Google cloud (hybrid architecture) , Connecting multi clouds, Multi cloud management concepts (discuss software like manage IQ) , Disaster recovery and backup in Public clouds with region and across region .

UNIT III Docker [13 Hours]

Docker concepts, docker and virtualization differences, docker hub, docker networking, docker volume, docker image, docker compose, docker swarm , docker enterprise edition

UNIT IV Security, SLA Management and Disaster recovery planning : [13 Hours]

Data in cloud, and how much security is required, responsibilities of each service models, security strategies, areas of focus on security, define SLA's and factors that impact SLA, Disaster recovery approach for your cloud, disaster recovery strategies for IaaS, PaaS, SaaS and hybrid clouds , case study

Text Books:

1. Cloud Computing: Concepts, Technology & Architecture (The Prentice Hall Service Technology Series from Thomas Erl) Hardcover – May 20, 2013 ,by Thomas Erl (Author)
2. Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS) Hardcover – January 28, 2014 by Michael J. Kavis (Author)
3. Mastering Citrix® XenServer® by Martez Reed
4. VMware vsphere 5.5 or above official documentation

B20BS3030	COMPUTER NETWORKS	L	T	P	C
Total Hours: 52		3	1	0	4

COURSE DESCRIPTION:

This course provides an introduction to computer networks, with a special focus on the Internet architecture and protocols. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, web and email protocols.

PRE-REQUISITE:

- Need to have knowledge about the fundamentals of how computer systems or devices communicate.

COURSE OBJECTIVES:

After successful completion of this course students will be able to

- Identify the different components and their respective roles in a communication System
- Design an enterprise network employing the common LAN technologies and be able to evaluate the advantages and disadvantages
- Describe the importance and functions of the OSI layers Physical, data link, network and transport layer.

COURSE OUTCOMES:

- To master the fundamentals of data communications and networks by gaining knowledge of data transmission concepts.
- Understanding the operation of physical and data link layer.
- Learning the algorithms used to design data networks.
- Understanding the principles of transport and application layers

COURSE CONTENT:

UNIT I Introduction**[13 Hours]**

Uses of computer networks, Network Hardware, Network Software, Reference Models, Network Standardization. The Physical Layer: Guided Transmission Media, Wireless Transmission, Digital modulation and multiplexing, Switching: Circuit switching, packet switching. Mobile telephone system.

UNIT II The Data Link Layer**[13 Hours]**

Data link layer design issues, Error Detection and Correction, Sliding window protocol, Example Data link protocols. MAC sub layer: channel allocation problem, Multiple Access Protocols, Ethernet, Wireless LANs, data link layer switching,

UNIT III The Network Layer**[13 Hours]**

Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of Service, The network layer in the internet.

UNIT IV Transport Layer**[13 Hours]**

Elements of Transport protocols, UDP, TCP, Performance issues. **APPLICATION LAYER:** Domain Name system, Electronic Mail, WWW.

Text Book:

1. Andrew S Tanenbaim, David J Wetherall “Computer Networks”, Pearson Education, 5th Edition, Elsevier Inc, 2014. Chapter-1, 2, 3, 4, 5, 6, 7

Reference Books:

1. Data Communications and computer Network, Prakash C Guptha, Second Edition, PHI learning Pvt Ltd, Nov 2014.
2. “Introduction to Data Communication & Networking” Behrouz Ferouzan, 5th Edition, Mc Graw Hill Education Pvt Ltd 2013
3. Larry & Peterson & Bruce S Davis; Computer networks-A System Approach, 5th Edition, Elsevier Inc, 2014.

B20BS3040	DATA MINING & DATA WAREHOUSING	L	T	P	C
Total Hours: 52		4	0	0	4

COURSE DESCRIPTION:

Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. The subject of data mining deals with methods for developing useful decision-making information from large databases. Using a combination of procedures from statistics,

mathematics, and computer science, analysts “mine the data” in the warehouse to convert it into useful information, hence the name data mining. Data mining is used to help individuals and organizations make better decisions. Collections of databases that work together are called data warehouses. This makes it possible to integrate data from multiple databases.

PRE-REQUISITE:

- The skills set required for data mining are basic knowledge database and Data Warehousing concepts.

COURSE OBJECTIVES:

- To understand Data Mining principles and techniques and introduce Data Mining as a cutting edge business intelligence.
- To discover interesting patterns, to analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To identify Applications and Trends of Data mining.
- To expose the students to the concepts of Data Warehousing Architecture and Implementation.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to,

- Discover and measure interesting patterns from different kinds of databases.
- Evolve Multidimensional Intelligent model from typical system.
- Discover the knowledge imbibed in the high dimensional system.
- Evaluate various mining techniques on complex data objects

COURSE CONTENT:

UNIT I

[13 Hours]

Data Mining – Introduction - Basic data mining tasks – data mining versus knowledge discovery in databases – Data mining issues – Data mining metrics – Social implications of data mining – Data mining from a database perspective. Data Mining Techniques: Introduction – A Statistical Perspective on data mining – Similarity Measures – Decision Trees.

UNIT II

[13 Hours]

Classification: Introduction – Issues in Classification - Statistical – based algorithms - Distance – based algorithms – Decision tree - based algorithms. **Clustering:** Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms: Agglomerative Algorithms – Divisive Algorithms - Partitional Algorithms: Minimum Spanning Tree – Squared Error Clustering algorithm – K-Means Clustering – Nearest neighbour algorithm – PAM algorithm – Bond Energy algorithm.

UNIT III

[13 Hours]

Association rules: Introduction - Large item sets - Basic algorithms: Apriori algorithm – Sampling Algorithm – Partitioning - Advanced Association Rules Techniques – Measuring the quality of rules.

Data Mining Applications: Data Mining for Financial Data Analysis - Data Mining for the Retail Industry - Data Mining for the Telecommunication Industry - Data Mining for Intrusion Detection.

UNIT IV

[13 Hours]

Data Warehouse Basic concepts : What is a Data Warehouse – Differences between operational database systems and Data Warehouses – Multi-tiered Architecture – Data Warehouse models – Extraction, Transformation and Loading – Metadata repository. **Data Warehouse modelling:** Data Cube and OLAP – Data cube: A Multidimensional Data model – Schemas for multidimensional data models – Dimensions: The role of concept hierarchies – Measures: Their categorization and computation – Typical OLAP operations.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison Wesley, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Data Mining and Data Warehousing, Bharat Bhushan Agarwal, SumitPrakahsTayal, University Science Press, First Edition 2009, New Delhi.
2. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing McGrawHill Publisher, 1997.
3. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.

B20BS3050	PYTHON FOUNDATION	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This course introduces computer programming using the Python programming language. Emphasis is placed on common algorithms and programming principles utilizing the standard library distributed with

Python. Upon completion, students should be able to design, code, test, and debug Python language programs.

PRE-REQUISITE:

- To get started with Python Programming You should have a basic knowledge of programming concepts and Computer Programming terminologies.

COURSE OBJECTIVES:

- To Define the implementation of python language
- To Identify various features in python
- To solve the given problem using the syntactical structures of python language.

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Understand the Basic Terminologies used in python programming
- Comprehend Branching and Looping statements in Python Programming
- Apply the concept of Functions in Problem solving.
- Implement the concepts of Classes, Objects & Inheritance

COURSE CONTENT:

UNIT I Introduction to Python

[13 Hours]

Introduction of python, origin, Programming Basics and Strings, Numbers and Operators, Variables Names for Values, Program Files, Directories ,Changing Data Through Names, Copying Data, Accessing a Tuple Through Another Tuple

UNIT II Decision making in Python

[13 Hours]

Making Decisions: Comparing Values for Sameness, Comparing Values for Difference, More Than or Equal, Less Than or Equal, Reversing True and False, Repetition, Handling Errors

UNIT III Functions in Python

[13 Hours]

Functions: Grouping Code under a Name, Describing a Function in the Function, Layers of Functions

UNIT IV Classes and Objects in Python

[13 Hours]

Classes and Objects: What is an Object, Defining a Class, Creating an Object from the Class, Objects and their Scope, Inheritance, Overriding a method, Writing simple programs using classes and objects in Python.

Text Books:

1. Introducing Python by Bill Lubanovic(chapters 1-6), Oriely Publications, 1st Edition
2. Python Programming for absolute beginners by Michael Dawson, Course Technology-A part of CENGAGE Learning, 3rd Edition

B20BS3061	ADVANCED VIRTUALIZATION CONCEPTS	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

Virtualization is one of the most quickly adopted technologies that has changed the way organizations and technology experts work. The objective of using virtualization is to centralize computing resources and administrative tasks while distributing workloads and improving scalability. Virtualization creates virtual copies of the actual resources and distributes for use among users. Network Virtualization, Storage Virtualization, and Server Virtualization are the most popular forms of virtualization. Although, even an operating system can be virtual.

PRE-REQUISITE:

- To start learning cloud computing one should have better knowledge in Virtualization concepts, operating system, Networking, and coding skills

COURSE OBJECTIVES:

The objective of this course is to:

- Get understanding of Advanced virtualization concepts
- Hands-on knowledge on advanced virtualization

COURSE OUTCOMES:

- Get understanding of advanced virtualization and hands-on lab on advanced virtualization on kvm clustering
- Hands-on knowledge on thin hypervisor (docker)
- Hands-on on knowledge on container orchestration
- Hands-on on knowledge on container orchestration advanced

COURSE CONTENT:

UNIT I Advanced virtualization concepts : **[13 Hours]**
 Virtualization clustering techniques, (hyperv- clustering, Xen clustering, VMware esxi clustering and KVM clustering), Shared storage virtualization clustering technologies (NFS, CIFS and SAN) , OS-level virtualization and para -virtualization concepts

UNIT II Windows containers (virtual containers to run apps) : **[13 Hours]**

Introduction to Docker on windows , docker volume for windows containers, docker networking for windows containers, docker images for windows containers, windows container operations, docker compose .

UNIT III Container Orchestration :

[13Hours]

Introduction to container orchestration , Orchestration tools concepts Kubernetes, kubernetes architecture, kubernetes master components introduction, Kubernetes Minion node components and role of each component in kubernetes architecture. Setup a kubernetes cluster of one master and one minion node . Deploy PODS, replication controller, replication sets, deployment, persistent volumes, persistent volume claims, load balancer, autoscaling of PODS , and rolling updates of deployment

UNIT IV Container Orchestration advanced

[13 Hours]

Introduction to Terraform and helm. Terraform architecture, terraform providers, install terraform client , terraform with kubernetes integration, write terraform templates , deploy application containers on kubernetes using terraform code . Helm architecture, tiller server , install helm client , Helm with kubernetes integration, deploy application containers on kubernetes using helm code

Lab Experiment:

1. Install and configure docker on windows 2016 and above
2. Perform windows Container operations (deploy, login, stop, start and delete)
3. Windows container volume, create, attach and delete
4. Windows container docker image, create and push to docker hub
5. Windows Docker networking, create multiple networks
6. Deploy 4 virtual machines running centos7 OS
7. SSH to VM1 and configure it Kubernetes master node
8. SSH to VM2 and configure it Kubernetes Minion node-01
9. Write pod.yaml and create Kubernetes POD – create and manage PODS
10. Write deployment.yaml and create Kubernetes deployment – create and manage deployments
11. Write replica.yaml and create Kubernetes replica and service
12. Deploy micro service with volume service for persistent data
13. Kubectl cli

14. POD Autoscaling
15. Rolling Updates
16. POD CPU and Memory reservation
17. Bring down complete cluster and recover back
18. Deploy kubernetes cluster on GKE
19. Connect to cluster
20. Deploy micro service and expose to google load balancer and access from internet

B20BS3062	LINEAR ALGEBRA	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

In this course students will study the concepts of Vector Spaces, Subspaces, Linear Combinations and Systems of Linear Equations, Linear Dependence and Linear Independence, Bases and Dimension, Maximal Linearly Independent Subsets; Linear Transformations, Null Spaces, and Ranges, The Matrix Representation of a Linear Transformation. This course impart knowledge of computer science subjects and also enhance the understanding of the underlying principles of computer science subjects. The purpose of this course is to provide students with skills and knowledge required to perform mathematical procedures. This course is widely used in all streams of computer science particularly in the field of Computer Science and Applications.

PRE-REQUISITE:

- Need to be comfortable with vectors matrices and three dimensional coordinate system

COURSE OBJECTIVES:

This course will:

- Recall basic concepts of matrices and matrix algebra
 - Present methods of solving systems of linear equations
 - Demonstrate basic concepts of vector spaces
 - Interpret the concepts of linear transformations by using the matrices
- Develop methods of computing and using eigen values and eigenvectors

COURSE OUTCOMES:

Students in this course will able to:

- Compute with the characteristic polynomial, eigenvectors and eigenvalues as well as the algebraic multiplicities of an eigenvalue and solve systems of linear equations by use of the matrix
- Analyze finite and infinite dimensional vector spaces and subspaces over a field and their properties, including the basis structure of vector spaces.
- Use the definition and properties of linear transformations and matrices of linear transformations and change of basis, including kernel, range and isomorphism. Compute inner products and determine orthogonality on vector spaces.
- Identify self-adjoint transformations and apply the spectral theorem and orthogonal decomposition of inner product spaces, the Jordan canonical form to solving systems of ordinary differential equations.

COURSE CONTENT:**UNIT I****[10 Hours]**

Vector Spaces, Subspaces, Linear Combinations and Systems of Linear Equations, Linear Dependence and Linear Independence, Bases and Dimension, Maximal Linearly Independent Subsets; Linear Transformations, Null Spaces, and Ranges, The Matrix Representation of a Linear Transformation, Composition of Linear Transformations, and Matrix Multiplication, Invertibility and Isomorphisms, The Change of Coordinate Matrix, The Dual Space; Elementary Matrix Operations and Elementary Matrices, The Rank of a Matrix and Matrix Inverses, Systems of Linear Equations.

UNIT II**[10 Hours]**

Properties of Determinants, Cofactor Expansions, Elementary Operations and Cramer's Rule; Eigenvalues and Eigenvectors, Diagonalizability, Invariant Subspaces and the Cayley-Hamilton Theorem; Inner Products and Norms, (No theorem proof).

UNIT III**[10 Hours]**

The Adjoint of a Linear Operator, Normal and Self-Adjoint Operators, Unitary and Orthogonal Operators and Their Matrices, Orthogonal Projections and the Spectral Theorem; Bilinear and Quadratic Forms (No theorem proof).

UNIT IV**[10 Hours]**

The Diagonal form, The Triangular form; The Jordan Canonical Form; The Minimal Polynomial; The Rational Canonical Form (No theorem proof).

Reference Books:

1. S. Friedberg, A. Insel, and L. Spence - Linear Algebra, Fourth Edition, PHI, 2009.
2. Jimmie Gilbert and Linda Gilbert – Linear Algebra and Matrix Theory, Academic Press, An imprint of Elsevier.
3. I. N. Herstein – Topics in Algebra, Vikas Publishing House, New Delhi.
4. Hoffman and Kunze – Linear Algebra, Prentice-Hall of India, 1978, 2nd Ed.,
5. P. R. Halmos – Finite Dimensional Vector Space, D. Van Nostrand, 1958.
6. S. Kumeresan – Linear Algebra, A Geometric approach, Prentice Hall India, 2000.

B20BS3063	E-COMMERCE	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

The subject of E-commerce basic concepts and technologies used in the field of E-Commerce, E-Payment systems, Inter Organizational and Intra Organizational E-Commerce, Advertising and

Marketing on Internet, Apply compression and decompression techniques and codec required for Video Conferencing, Follow ethics in the usage of Smart Card and Digital Token Demonstrate and analyze the difference between functional testing and structural testing, Analyze the performance of fault based testing, planning and Monitoring.

PRE-REQUISITE:

- Need business model and technologies , social innovation and marketing strategies

COURSE OBJECTIVES:

The objectives of the course are:

- To introduce the concept of electronic commerce, and to understand how electronic commerce is affecting business enterprises, governments, consumers and people in general. In addition, we will study the development of websites using relevant software tools.
- Acquaint students with a fundamental understanding of the environment and strategies in the New Economy.
- Provide analytical tools to understand opportunities in unserved or underserved New Economy markets.
- Provide a fundamental understanding of the different types and key components on business models in the New Economy.
- Provide guiding principles behind the design and strategy of the customer web interface. Provide insights on how to implement strategy in the New Economy.

COURSE OUTCOMES:

Gain Knowledge on:

- The basic concepts and technologies used in the field of E-Commerce.
- E-Payment systems.
- Inter Organizational and Intra Organizational E-Commerce.
- Advertising and Marketing on Internet.
- Apply compression and decompression techniques and codec required for Video Conferencing
- Follow ethics in the usage of Smart Card and Digital Token.

- Understand and analyze the difference between functional testing and structural testing.
- Analyze the performance of fault based testing, planning and Monitoring the process

COURSE CONTENT:

UNIT I Introduction

[10 Hours]

Electronic Commerce and physical commerce, The DIGITAL phenomenon, Different types of Ecommerce, examples, E-Commerce scenarios, Advantages of E-Commerce, Myths about E-commerce.

Technologies (Fundamentals): Internet and WWW, web system architecture, URL, An overview of the internet, overview of HTTP, HTTP.TB 1: Chapter – 01 & 02

UNIT II Internet payment systems

[10 Hours]

Characteristics of payment systems, 4C payment methods, SET protocol for credit card payment, E – Cash, E-Check, Micropayment system, Overview of smart card, MONDEX.**Consumer oriented E-Commerce:** Traditional retailing and e-retailing, Benefits of e-retailing, Key success factors, Models of e-retailing, Features of e-retailing.TB 1: Chapter – 10 & 11.

UNIT III Business oriented E- Commerce

[10 Hours]

Features of B2B e-commerce, Business models, Integration.**E-Services:** Categories of e-services, Web-enables services, Matchmaking services, TB 1: Chapter – 12 & 13.

UNIT IV Web advertising and web publishing

[10 Hours]

Traditional versus internet advertising, Internet advertising techniques and strategies, Business models for advertising and their revenue streams, Pricing model and measurement of the effectiveness of advertisements, Web publishing-goals and criteria, web site development methodologies, logical design of the user interface I-abstract user interface object, logical design of the user interface-II flow of interaction, Usability testing and quality assurance, Web presence and visibility.TB 1: Chapter – 14.

Text Books:

1. ‘E-Commerce, fundamentals and Applications’ by Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, WILEY Edition.

Reference Books:

1. Ravi Kalakota, Andrew B. Whinston, Frontiers of Electronic Commerce, Pearson Education, 2009.
2. S.Jaiswal, E-Commerce, Galgotia, revised edition, 2008

B20BS3070	CLOUD COMPUTING ARCHITECTURE AND DESIGN LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. ESXi Hypervisor – Installation and Configure
2. vCenter – Installation and Configure

3. Virtual Machine (Linux) – Create and Manage on ESXi
4. Virtual Machine (Windows) – Create and Manage on ESXi
5. Configure Cluster and High Availability of VMware Esxi server
6. Xen Server – Installation and Configure
7. Xen Center – Installation and Configure
8. Virtual Machine (Linux) – Create and Manage on Xen server
9. Virtual Machine (Windows) – Create and Manage on Xen Server
10. Configure Cluster and High Availability on Xen Server

B20BS3080	PYTHON FOUNDATION LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

- Lab 01: Write a Python program to establish DB connection & Accept queries from user & execute it & return the result.
- Lab 02: Write a Python program which accepts the radius of a circle from the user and compute the area
- Lab 03: Define a class Person and its two child classes: Male and Female. All classes have a method "getGender" which can print "Male" for Male class and "Female" for Female class.
- Lab 04: Define a function that can accept an integer number as input and print the "It is an even number" if the number is even, otherwise print "It is an odd number".
- Lab 05: A website requires the users to input username and password to register. Write a program to check the validity of password input by users.
Following are the criteria for checking the password:
 1. At least 1 letter between [a-z]
 2. At least 1 number between [0-9]
 1. At least 1 letter between [A-Z]
 3. At least 1 character from [\$#@]

4. Minimum length of transaction password: 6

5. Maximum length of transaction password: 12

Your program should accept a sequence of comma separated passwords and will check them according to the above criteria. Passwords that match the criteria are to be printed, each separated by a comma.

Example

If the following passwords are given as input to the program:

ABd1234@1, aF1#, 2w3E*, 2We3345

Then, the output of the program should be:

ABd1234@1

- Lab 06: Write a program that computes the net amount of a bank account based a transaction log from console input. The transaction log format is shown as following:

D 100

W 200

D means deposit while W means withdrawal.

Suppose the following input is supplied to the program:

D 300

D 300

W 200

D 100

Then, the output should be:500

B20BS3090	SOFT SKILLS
Total Hours:30	

B20BS3100	SKILL DEVELOPMENT PROGRAM
Total Hours:32	

FOURTH SEMESTER

S. N O	Cod e	Titl e	HC /SC /F C	Credit Pattern			Credits	Workin g Hrs
				L	T	P		
1	B20BS4011	Language –IV Kannada	FC				2	2
	B20BS4012	Language –IV Hindi		2	0	0		

	B20BS4013	Language –IV Additional English						
2	B20BS4020	Public Cloud – AWS,AZURE and GOOGLE	HC	3	0	0	3	3
3	B20BS4030	Software Engineering	HC	2	1	0	3	4
4	B20BS4040	Automation Tools For Cloud Deployment	HC	2	0	1	3	4
5	B20BS4050	Cloud Developer tools and Ecosystem	HC	3	0	0	3	3
6	B20BS4061	Advanced Computer Networks	SC	3	0	0	3	3
	B20BS4062	Cyber Physical systems						
	B20BS4063	The Internet Of things						
7	B20BS4071	Programming with Ruby & Golang	SC	2	0	1	3	4
	B20BS4072	Introduction to Web Programming						
	B20BS4073	Java Programming						
Practical Courses								
8	B20BS4080	Public Cloud –AWS,AZURE and GOOGLE Lab	HC	0	0	2	2	4
9	B20BS4090	Cloud Developer tools and Ecosystem Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
10	B20BS4100	Soft skills						
11	B20BS4110	Skill Development Program						
Total Credits				17	1	6	24	31

B20BS4011	LANGUAGE –IV KANNADA	L	T	P	C
Total Hours: 26		2	0	0	2

COURSE DESCRIPTION:

ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗೂ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಸಾಹಿತ್ಯ, ಕಲೆ, ವಾಣಿಜ್ಯ, ಆಡಳಿತಾತ್ಮಕ ಮತ್ತು ವಿಜ್ಞಾನದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಮೊದಲ ಎರಡು ಸೆಮಿಸ್ಟರ್ ಮೂರು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು; ಮೂರು ಮತ್ತು ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ ಎರಡು ಕ್ರೆಡಿಟ್‌ಗಳನ್ನು ಹೊಂದಿದೆ.

PRE-REQUISITE:

- ಕನ್ನಡ ಭಾಷೆಯ ಬಗೆಗೆ ಪ್ರಾಥಮಿಕ ತಿಳುವಳಿಕೆ ಅಗತ್ಯ.
- ಭಾಷೆಯನ್ನು ಓದಲು ಮತ್ತು ಬರೆಯಲು ತಿಳಿದಿರಬೇಕು.
- ಪದವಿ ಪೂರ್ವ ಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಓದಿರಬೇಕು.

COURSE OBJECTIVES:

ನಾಲ್ಕು ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿ ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯವನ್ನು ಪರಿಚಯಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ. ಅದರಂತೆ ಮೊದಲನೆಯ ಸೆಮಿಸ್ಟರ್‌ನಲ್ಲಿ ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯವನ್ನು ಪಠ್ಯವನ್ನಾಗಿ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸದಭಿರುಚಿಯನ್ನು ಮೂಡಿಸಲಾಗುತ್ತದೆ. ಸಾಂಸ್ಕೃತಿಕ ತಿಳುವಳಿಕೆಯ ಜೊತೆಗೆ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸದ ಕಡೆಗೆ ಗಮನ ನೀಡಲಾಗುತ್ತದೆ.

- ಭಾಷೆ, ಸಾಹಿತ್ಯ, ಇತಿಹಾಸ ಮತ್ತು ಸಂಸ್ಕೃತಿಗಳನ್ನು ಕನ್ನಡ, ಕರ್ನಾಟಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಪರಿಚಯಿಸಲಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಅನುವಾಗುವಂತೆ ಹಾಗೂ ಅವರಲ್ಲಿ ಮಾನವ ಸಂಬಂಧಗಳ ಬಗ್ಗೆ ಗೌರವ, ಸಮಾನತೆ ಮೂಡಿಸಿ, ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪಠ್ಯಗಳ ಆಯ್ಕೆಯಾಗಿದೆ.
- ಅವರಲ್ಲಿ ಸೃಜನಶೀಲತೆ, ಶುದ್ಧ ಭಾಷೆ, ಉತ್ತಮ ವಿಮರ್ಶಾ ಗುಣ, ನಿರರ್ಗಳ ಸಂಭಾಷಣೆ, ಭಾಷಣ ಕಲೆ ಹಾಗೂ ಬರಹ ಕೌಶಲ್ಯಗಳನ್ನು ಬೆಳೆಸುವುದು ಗುರಿಯಾಗಿದೆ.
- ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅನುಕೂಲವಾಗುವಂತಹ ವಿಷಯಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ಸೂಕ್ತ ಪಠ್ಯಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ.

COURSE OUTCOMES:

ಜನಪದ, ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನದ ವಿವಿಧ ಪ್ರಕಾರದ ಕಾವ್ಯಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಹಾಗೂ ನಾಟಕ ಸಾಹಿತ್ಯ ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ.

- ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಪರಿಸರ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವು ಬೆಳೆಯುತ್ತದೆ.
- ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.
- ಉತ್ತಮ ಸಂವಹನ ಕಲೆಯನ್ನು ಬೆಳೆಸುವ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸುತ್ತದೆ.
- ಸಂಶೋಧನಾ ಮನೋಭಾವ ಮತ್ತು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುತ್ತದೆ.

COURSE CONTENT:

Unit – 1: ದಲಿತ ಬಂಡಾಯ ಕವಿತೆಗಳು

[07 Hours]

- | | |
|-----------------------|-----------------------|
| 1. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು | - ಸಿದ್ದಲಿಂಗಯ್ಯ |
| 2. ಇಲ್ಲ ಬಿಡುಗಡೆ ನಮಗೆ | - ವೀ.ಚಿಕ್ಕವೀರಯ್ಯ |
| 3. ಮಗು ಮತ್ತು ಹಣ್ಣುಗಳು | - ಹೆಚ್.ಎಸ್.ಶಿವಪ್ರಕಾಶ್ |

Unit – 2: ಶ್ರೀವಾದಿ ಮತ್ತು ಸಮಕಾಲೀನ ಕವಿತೆಗಳು

[07 Hours]

- | | |
|----------------------------|----------------------|
| 1. ತಡೆ | - ಚ. ಸರ್ವಮಂಗಲ |
| 2. ಧ್ಯಾನಸ್ತ ಬಂಗಲೆಗಳು | - ವಿ.ಆರ್. ಕಾರ್ಪೆಂಟರ್ |
| 3. ಟ್ರಿಯಲ್ ರೂಮಿನ ಅಪ್ಸರೆಯರು | - ಭುವನ ಹಿರೇಮಠ |

Unit –3: ಆಡಳಿತಾತ್ಮಕ ಕನ್ನಡ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಲೇಖನಗಳು

[06 Hours]

- | | |
|---|------------------|
| 1. ಪತ್ರಲೇಖನ ಮತ್ತು ವರದಿಗಳ ತಯಾರಿ | |
| 2. ವಿಜ್ಞಾನ ಸಂವನಕ್ಕೆ ಆಧುನಿಕ ತಂತ್ರಜ್ಞಾನದ ಸವಲತ್ತುಗಳು | - ಟಿ.ಜೆ.ಶ್ರೀನಿಧಿ |
| 3. ವಿಜ್ಞಾನ ಮತ್ತು ಸಮಾಜ | - ಹೆಚ್.ನರಸಿಂಹಯ್ಯ |

Unit -4: ಕಾದಂಬರಿ

[06 Hours]

- | | |
|--|----------------------|
| 1. ಕಾಡು | - ಶ್ರೀಕೃಷ್ಣ ಆಲನಹಳ್ಳಿ |
| 9. ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗ-2, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2004 | |
| 10. ಶಿವರುದ್ರಪ್ಪ ಜಿ.ಎಸ್. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮೀಕ್ಷೆ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2013 | |

Text Books:

Reference Book:

1. ಮುಗಳಿ ರಂ.ಶ್ರೀ., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ಗೀತಾ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು. 2014
2. ಸೀಮಾತೀತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ 1,2,3,4,5 ಮತ್ತು 6, ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಮೈಸೂರು. 2014
3. ಡಾ. ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಸಾಹಿತ್ಯ ಸಂಸ್ಕೃತಿ ಮತ್ತು ದಲಿತ ಪ್ರಜ್ಞೆ ಪ್ರಕಾಶಕರು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು. 2014
4. ಡಾ. ಈ.ಎಸ್. ಆಮೂರ, ಕನ್ನಡ ಕಥನ ಸಾಹಿತ್ಯ : ಕಾದಂಬರಿ, ಪ್ರಕಾಶಕರು ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. 2016
5. ದೇಶಪಾಂಡೆ ಎಸ್.ಎಲ್., ಬೇಂದ್ರೆ ಶರೀಫರ ಕಾವ್ಯಯಾನ, ಪ್ರಕಾಶಕರು ದೇಸಿ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು. 2013
6. ಕೀರ್ತನಾಥ ಕುರ್ತಕೋಟಿ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ, ಪ್ರಕಾಶಕರು ಕುರ್ತಕೋಟಿ ಮೆಮೋರಿಯಲ್ ಟ್ರಸ್ಟ್, ಧಾರವಾಡ. 2009
7. ಶಾಮರಾಯ ತ.ಸು., ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ, ಪ್ರಕಾಶಕರು ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು -2014
8. ಸಂ. ಡಾ! ಸಿ. ಆರ್. ಚಂದ್ರಶೇಖರ್, ಮುಂದಾಳುತನದ ಲಕ್ಷಣಗಳನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದು ಹೇಗೆ?, ಪ್ರಕಾಶಕರು ನವಕರ್ನಾಟಕ ಪಬ್ಲಿಕೇಷನ್ಸ್ ಪ್ರೈವೇಟ್ ಲಿಮಿಟೆಡ್. 2010

B20BS4012	LANGUAGE –IV HINDI	L	T	P	C
Total Hours: 26		2	0	0	2

COURSE DESCRIPTION:

यह पाठ्यक्रम नौसिखिया, अपनी भाषा की क्षमता का विकास करने हेतु तथा विभिन्न साहित्यिक प्रक्रियाओं द्वारा समाज, संस्कृति एवं जीवन के मूल्यों को समझने हेतु अभिकल्पित है।

PRE-REQUISITE:

- अध्येता, पी.यु.सी के स्तर पर द्वितीय भाषा के रूप में हिन्दी का अध्ययन करना चाहिए।
- हिन्दी साहित्य के इतिहास का संक्षिप्त ज्ञान की आवश्यकता है।
- हिन्दी व्याकरण का अवबोधन आवश्यक है।
- अंग्रेज़ी – हिन्दी अनुवाद से संबंधित जानकारी जरूरी है।

COURSE OBJECTIVES:

1. संदर्भानुसार उचित भाषा का प्रयोग करने की दक्षता को छात्रों में उत्पन्न करना।
2. साहित्य के माध्यम से समाज एवं मानवीय मूल्यों को समझाकर, उन मूल्यों की रक्षा हेतु प्रेरित करना।
3. छात्रों में पुस्तक पठन एवं लेखन की अकृतिम प्रवृत्ति स्थापित करना।
4. अध्येताओं में साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास करना।

COURSE OUTCOMES:

अध्ययन की समाप्ति पर अध्येता –

1. सामाजिक मूल्य एवं नैतिक जवाबदेही को स्वीकार कर सकता है।
2. साहित्य की प्रासंगिकता को जीवन में समझने की दक्षता रखता है।
3. समाज में अंतर्निहित पद्धतियाँ एवं विचारधाराओं का व्याख्यान करने में सक्षम बन सकता है।
4. साहित्य के माध्यम से प्रभावी एवं कुशल संचार का विकास कर सकता है।

COURSE CONTENT:

UNIT I	[07 Hours]
उपन्यास - दौड़ – ममता कालिया	
UNIT II	[07 Hours]
उपन्यास - दौड़ – ममता कालिया	
UNIT III	[06 Hours]

UNIT IV

[06 Hours]

भाषाई कम्प्युटर

- 1 यूनिकोड की वर्तमान स्थिति
- 2 हिन्दी में पावर पॉइंट का महत्व
- 3 हिन्दी में एम एस वर्ड, एक्सल शीट निर्माण विधि

आ

ब्लॉग लेखन

- 1 ब्लॉग लेखन का महत्व
- 2 हिन्दी में ब्लॉग लेखन की प्रविधि
- 3 इंटरनेट पर सामाग्री सृजन एवं यू ट्यूब पर प्रकाशन

सूचना : प्रत्येक इकाई 25 अंक के लिए निर्धारित है ।

Text Books:

उपन्यास - दौड़ - ममता कालिया

Reference Book:

1. हिन्दी उपन्यास का विकास - मधुरेश
2. हिन्दी टंकण सिद्धांत - शिवनारायण चतुर्वेदी
3. हिन्दी साहित्य का इतिहास - डॉ. नागेन्द्र
4. आधुनिक हिन्दी साहित्य का इतिहास - डॉ. बच्चन सिंह
5. हिन्दी साहित्य का नवीन इतिहास - डॉ. लाल साहब सिंह
6. शुद्ध हिन्दी कैसे बोले कैसे लिखे- पृथ्वीनाथ पाण्डे
7. प्रयोजनमूलक हिन्दी - डॉ. अम्बादास देशमुख
8. कंप्यूटर के भाषिक अनुपयोग - विजयकुमार मलहोत्रा

B20BS4013	LANGUAGE-IV ADDITIONAL ENGLISH	L	T	P	C
Total Hours: 26		2	0	0	2

COURSE DESCRIPTION:

This 2-credit course helps the learner explore various socio-cultural issues through literature. The course provides insight on matters like education and culture that are pertinent in the contemporary society. The course also offers multi-dimensional perspective in the genres of literature and contributes for language enrichment.

PRE-REQUISITE:

The student must possess fair knowledge of language, literature, culture and society.

COURSE OBJECTIVES:

- To infer the myths from the contemporary perspective.
- To outline the idea of family represented in literature.
- To interpret horror and suspense as a genre of literature.

To assess the impact of education in building a society

COURSE OUTCOMES:

On completion of the course, learners will be able to:

- Examine the relevance of myths and mythology.
- Demonstrate family values and ethics essential to live in the society.
- Analyze horror and suspense as a significant genre of literature.
- Evaluate the applicability of academic contribution in building a society.

COURSE CONTENT:

UNIT I Myths & Mythology

[06 Hours]

John W. May – Narcissus

W.B. Yeats – The Second Coming

Devdutt Pattanaik - Shikhandi and the Other Stories They Don't Tell you (Extracts)

UNIT II Family & Relationships

[06 Hours]

Nissim Ezekiel – Night of the Scorpion

Langston Hughes – Mother to Son
Kate Chopin – The Story of an Hour
Henrik Ibsen – A Doll’s House (Extract)

UNIT III Horror & Suspense

[07 Hours]

Edgar Allan Poe – The Raven
Bram Stoker – A Dream of Red Hands
Satyajit Ray – Adventures of Feluda (Extract)

UNIT IV Education

[07 hours]

The Dalai Lama – The Paradox of Our Times
Kamala Wijeratne – To a Student
Sudha Murthy – In Sahyadri Hills, a Lesson in Humility
Frigyes Karinthy – Refund

Reference Books:

1. Finneran, Richard J. The Collected Works of W.B. Yeats(Volume I: The Poems: Revised Second Edition). Simon & Schuster, 1996.
2. Pattanaik, Devdutt. Shikhandi: And Other ‘Queer’ Tales They Don’t Tell You. Penguin Books, 2014.
3. Ezekiel, Nissim. Collected Poems (With A New Introduction By John Thieme). OUP, 2005.
4. Hughes, Langston. The Collected Poems of Langston Hughes. Vintage, 1995.
5. Chopin, Kate. The Awakening and Selected Stories of Kate Chopin. Simon & Schuster, 2004.
6. Ibsen, Henrik. A Doll’s House. Maple Press, 2011.
7. Poe, Edgar Allan. The Complete Poetry of Edgar Allan Poe. Penguin USA, 2008.
8. Stoker, Bram. Dracula. Fingerprint Publishing, 2013.
9. Ray, Satyajit. The Complete Adventures of Feluda (Vol. 2). Penguin Books Ltd., 2015.
10. Lama, Dalai. Freedom In Exile: The Autobiography of the Dalai Lama of Tibet. Little, Brown Book Group, 1998.
11. Murthy, Sudha. Wise and Otherwise: A Salute to Life. Penguin India, 2006.

B20BS4020	PUBLIC CLOUD –AWS,AZURE AND GOOGLE	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

Windows Azure provides a scalable environment with compute, storage, hosting, and management capabilities. It links to on-premises applications with secure connectivity, messaging, and identity management. Amazon Web Services has provided companies of all sizes with an infrastructure platform in the cloud and gain access to a suite of elastic IT infrastructure services as businesses would demand. Enterprises that want to use open source stack such as JBoss, GlassFish, etc. can use Amazon AWS and OrangeScape Enterprise edition. Google open architecture and easy integration with popular open-source tools allows for a faster time to value. Google fully managed, serverless approach removes operational overhead by handling big data analytics solution's performance, scalability, availability, security, and compliance needs automatically, so you can focus on analysis instead of managing servers.

PRE-REQUISITE:

- Basic knowledge about any programming language and basic knowledge about cloud computing and virtualization.

COURSE OBJECTIVES:

- Hands on knowledge on Amazon cloud
- Hands on knowledge on Azure cloud
- Hands-on knowledge on Google cloud

COURSE OUTCOMES:

- Ability to deploy a customer's complete web infrastructure with end to end to design with auto scaling mode, load balancer and public DNS on Amazon cloud and azure cloud
- Ability to provision cloud storage, Cloud database services, deploying web application and connecting to database service securely

- Ability to control access and roles to the cloud for a customer account and configure virtual private cloud in Amazon cloud
- Ability to provision and manage customer web infrastructure and manage on AWS and azure cloud.

COURSE CONTENT:

UNIT I Microsoft Azure Cloud Foundation

[10 Hours]

Azure overview, choosing a subscription, exploring the portal, examining Azure services like compute services, Data Services, App services, network services, Designing a system for Azure with case study, Interacting with Azure windows and Linux virtual machines, attaching and detaching cloud storage to Azure virtual machines.

UNIT II Microsoft Azure Cloud Intermediate

[10 Hours]

Deploy, configure, monitor, and scale websites, Implement virtual machine workloads, images, disks, networking and storage, Configure, deploy, manage, and monitor cloud services, Implement blobs, Azure files, SQL databases, and recovery services, Manage access and configure diagnostics, monitoring, and analytic, Implement an Azure Active Directory and integrate apps, Configure and modify virtual networks

UNIT III Amazon Web Services Cloud

[10 Hours]

Amazon Web Services overview, working with Amazon Simple Storage Service (S3), Elastic compute cloud: security groups, key pair, launch Linux and windows instances .

UNIT IV Amazon Cloud Intermediate

[10 Hours]

Amazon machine images modification, EC2 applications, Simple queue Service, SQS applications, Elastic Block Storage, Dynamo DB, AWS networking, AWS security ,RDS, beanstalk, code pipeline, code commit

Text Books:

1. Learning Windows Azure Paperback – October 16, 2014, by Geoff Webber-Cross
2. Implementing Microsoft Azure Infrastructure Solutions, By Michael Washam, Rick Rainey
3. Programming Amazon Web Services: S3, EC2, SQS, FPS, and SimpleDB Paperback ,by James Murty
4. AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud Paperback – March 25, 2015 by Mike Ryan (Author)
5. Amazon Web Services For Dummies Paperback – September 10, 2013 by Bernard Golden (Author)

Reference Books:

1. Getting started with Amazon book series available on AWS Book references
<http://www.amazon.com/Getting-Started-AWS-Amazon-Services-ebook>
2. Google Cloud Platform for Architects: Design and manage powerful cloud solutions Kindle Edition by Vitthal Srinivasan (Author), Janani Ravi (Author), Judy Raj (Author)

B20BS4030	SOFTWARE ENGINEERING	L	T	P	C
Total Hours: 52		2	1	0	3

COURSE DESCRIPTION:

Software engineering is the branch of computer science that creates practical, cost-effective solutions to computing and information processing problems, preferentially by applying scientific knowledge, developing software systems in the service of mankind. This course is aimed at helping students build up an understanding of how to develop a software system from scratch by guiding them thru the development process and giving them the fundamental principles of system development. The course will initiate students to the different software process models, project management, software requirements engineering process, systems analysis and design as a problem-solving activity, key elements of analysis and design, and the place of the analysis and design phases within the system development life cycle.

PRE-REQUISITE:

- To learn Software Engineering, you must have a basic knowledge of computer fundamentals, software systems, and software development processes.

COURSE OBJECTIVES:

- To classify the various Software Process Models.
- To analyze a given problem and identify requirements.
- To design a software using standard software engineering techniques.
- To apply well defined software testing strategies to produce quality software.

COURSE OUTCOMES:

After the completion of the course the student will be able to:

- Apply knowledge of software engineering to analyze and identify requirements.
- Design and manage the development of a computing-based system, component or process to meet desired needs within realistic constraints in one or more application domains.
- Function with multidisciplinary teams

- Perform software testing using well defined strategies to produce quality software.

COURSE CONTENT:

UNIT I Introduction

[13 Hours]

The Nature of Software, Software Engineering, the Software Process, and Process Models: A Generic Process Model: Defining a Framework Activity, Identifying a Task Set. Process Assessment and Improvement, Perspective Process Models: The Waterfall Model, Incremental Process Model, Evolutionary Process Models.

Agile Development: What is Agility? Agility and the Cost of Change, Agile Process: Agility Principles, Human Factors, Extreme Programming (XP), Other Agile Process Models: Adaptive Software Development (ASD), Scrum, Dynamic System Development Method(DSDM), Crystal, Feature Driven Development(FDD).

UNIT II Requirements Modeling

[13 Hours]

Understanding Requirements: SRS Template (Example Case Study) ,Developing Use Case, Requirements Modeling:RequirementsAnalysis,Scenario Based Methods, UML Models That Supplement the Use Case, Class-Based Methods, Behavior, Flow oriented models – DFD's,And Web/Mobile Apps.

UNIT III Design Concepts

[13 Hours]

Design Concepts: The Design Process, Design Concepts, The Design Model, User Interface Design: The Golden Rules, User Interface Design Patterns. WebApp Design: Design Goals, A design pyramid for web app, WebApp interface design.

UNIT IV Software Quality Assurance and Software Testing

[13 Hours]

Elements of Software Quality Assurance, SQA Tasks, Goals, and Metrics, Six Sigma for Software Engineering, Software Reliability. Software Testing: Humans and Errors, Bugs, Faults and Failures, Purpose of Software Testing, Testing Techniques, Types of Testing, Basic Concepts and definitions. Testing life Cycle, Software Testing Verification and Validation Techniques, Static Testing, Testing Tool: Introduction, Automation Testing Framework, Types of automation tools, Case Study, Test Planning.

Text Book:

1. Roger S. Pressman – “SOFTWARE ENGINEERING, A Practitioner’s approach”, 7th Edition, McGRAW-HILL Publication, 2010. (UNIT I – IV) (Chapters: 1, 2, 3, 5, 6, 7, 8, 11, 13, 16)
2. SandeepDesai, AbhishekSrivastava–“SOFTWARE TESTING : A Practical Approach”, 2nd Edition, PHI Learning Pvt Ltd, 2016 (UNIT IV –Software Testing) (Chapters: 1, 2, 3, 4, 6, 7)

Reference Books:

1. Software Engineering, Ian Somerville, 9th edition, Pearson education.
2. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

Example Case Study for SRS:

The railway reservation system functions as follows;

The passenger is required to fill in a reservation form giving detail of his journey. The counter clerk ensures whether the place is available. If so, entries arc made in i register, tickets are prepared, amount

is computed and cash is accepted. A booking statement is prepared in triplicate format from the reservation register. One copy of it is retained as office copy; the other is pasted on compartment and third is passed on to the train conductor. Besides booking statement, cash statement is prepared at the end of each shift. Prepare SRS and system specification for above system.

B20BS4040	AUTOMATION TOOLS FOR CLOUD DEPLOYMENT	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

In this course we learn the processes and tools an organization uses to reduce the manual efforts associated with provisioning and managing cloud computing workloads. IT teams can apply cloud automation to private, public and hybrid cloud environments.

PRE-REQUISITE:

- Need to have basic knowledge in Cloud architecture and deployment models

COURSE OBJECTIVES:

- Introduction to Chief Configuration Management Framework
- Introduction to Puppet configuration management framework
- Introduction to Ansible configuration management framework
- Hands on Knowledge on install and configure Chef and puppet

COURSE OUTCOMES:

- Able to automate package deployment on win and linux nodes and Bootstrap windows server, rhel, Ubuntu nodes and deploy web servers on them
- Ability to write infrastructure deployment code like cookbook(chef)
- Ability to write infrastructure deployment code like manifests (puppet)
- Ability to build chef ,ansible and puppet server infrastructure to manage nodes

COURSE CONTENT:

UNIT I Chef Automation tool

[13Hours]

Introduction, The Chef Server, Installing and configuring the Chef Server, Install and configure chef workstation on windows and linux, Bootstrap a windows 2016, redhat linux and Ubuntu server, chef-solo. Modelling your chef infrastructure, Integrating with the cloud, working with cookbooks, chef environments , advanced cookbooks

UNIT II Puppet Automation tools

[13Hours]

Introduction to puppet architecture and components, deploy puppet server, deploy puppet nodes, Configure puppet master and agent nodes to communicate, write manifests to automation deployment of OS update, install software, start services, copy a file, create user and groups on the nodes via puppet master

UNIT III Ansible Foundation

[13Hours]

Introduction to ansible, ansible architecture and components, Deploy ansible master, register ansible master managed nodes windows, Centos and ubuntu, write ansible playbooks to automation deployment of OS update, install software, start services, copy a file, create user and groups on the nodes via Ansible master on Windows node, centos node, and ubuntu node

UNIT IV Ansible Advanced

[13 Hours]

Introduction to ansible tower, Role based access on ansible tower, run playbooks via ansible tower, adhoc ansible commands , understanding handlers in ansible ,working with ansible variables, working with templates , error handling in playbook, use run once , working with ansible vault , working with cloud moduels like aws, google cloud and azure cloud

Text Books:

1. Chef: Powerful Infrastructure Automation Paperback – Import, 16 May 2017 by John Ewart (Author), Matthias Marschall (Author), Earl Waud (Author)
2. Book on puppet : Learning Puppet Jussi Heinonen
3. <https://www.packtpub.com/networking-and-servers/learning-puppet>

HANDS ON LAB

1. Chef server- Install and configure
2. Install and configure Chef-Workstation on Ubuntu
3. Install and configure Chef-Workstation on Windows 7
4. Create and apply a cookbook for Ubuntu server ,centos7 and win 2016
5. Creating dependency cookbook
6. Install and configure puppet server and puppet nodes
7. Write manifest to automate deployment of web infrastructure on centos7, Ubuntu and windows 2016 server
8. Install and configure ansible master and ansible windows centos7 and ubuntu nodes
9. Write playbooks for -
 - User and group management
 - Os updates and upgrades
 - Install and unistall software,
 - Start and stop services
 - Copy files to nodes
 - Error handling,

- Working with variables
- Run once

Aws ec2 module to launch instance ,stop and start

B20BS4050	CLOUD DEVELOPER TOOLS AND ECOSYSTEMS	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This course introduces to design, develop, and deploy applications that seamlessly integrate components from the Google Cloud ecosystem.

PRE-REQUISITE:

- Basic Knowledge on AWS and AZURE and how to design, develop, and deploy applications using Cloud

COURSE OBJECTIVES:

- The objective of this course is to:
- Describe Kubernetes and what it is used for
- Deploy single and multiple container applications on Kubernetes
- Use Kubernetes services to structure N-tier applications
- Manage application deployments with rollouts in Kubernetes
- Ensure container preconditions are met and keep containers healthy

COURSE OUTCOMES:

The student should know and understand:

- Design and deploy applications on Kubernetes Cluster
- Leverage AWS services to make your infrastructure scalable, reliable, and highly available
- Designing highly scalable, available, and reliable cloud-native applications
- Understand container and OpenShift architecture and Deploy multi-container applications.

COURSE CONTENT:

UNIT I Kubernetes Developer

[10Hours]

Introduction to Kubernetes ,minikube setup your practice cluster, Kubernetes api primitives, creating pods, namespaces, configmaps ,security contexts, resource requirements, secrets, service accounts, Liveness and readiness probes, container logging, metrics server, monitoring applications , debugging, Labels, selectors, annotations, rolling updates and rollback, jobs and cronjobs, services and network

UNIT II AWS Developer

[10Hours]

AWS Global infrastructure, AWS shared security model, Identity and access management (STS and roles), Key management services, AWS inspector, Application load balancers, AWS lambda , Elastic container services, Elastic beanstalk,S3 operations (encryption, object versioning, lifecycle polices, static web hosting ,CORS, cloud front, DynamoDB, Relational Database services (RDS) , SNS and SQS,API Gateway , Cloudwatch, Cloud formation

UNIT III Google Developer

[10Hours]

Introduction to Google cloud developer Tools, Building and testing applications on Google cloud, Building a CI pipeline, Deploy apps on Compute engine, kubernetes engine and App engine, Cloud functions, Deployment Manager, Deploy app on kubernetes engine and connect to Google cloud SQL , Deploy app on kubernetes engine and connect to Datastor/firestore, stackdriver monitoring of your compute engine, application health check, Cloud source repositories

UNIT IV Openshift and Cloud foundry

[10Hours]

Introduction to agile, CI/CD, Devops, and microservices. Pivotal cloud foundry introduction and components and architecture, cloud controller, Diego, loggregator, routing, Buildpacks, droplets and container images, cloud foundry cli, orgs and spaces working on manifests, blue green deployment, push apps of different languages like ruby, java, python and ,node.js on cloud foundry , 12factor.net concepts, scaling your apps, logging and monitoring . Introduction to Openshift , origin, OKD , Install minishift, Openshift commands, deploy apps on Openshift and scale apps on Openshift .

Text Books:

1. Kubernetes developer : the Kubernetes for Application Developers eBook
2. Aws Certified Developer - Associate Guide Paperback – 2017 by Vipul Tankariya Bhavin Parmar (Author)
3. Google Cloud Platform for Developers by Ted Hunter, Steven Porter
4. Openshift Ebook : <https://www.openshift.com/resources/ebooks/openshift-for-developers>
5. Cloud Foundry: The Definitive Guide: Develop, Deploy, and Scale 1st Edition, Kindle Edition by Duncan C. E. Winn (Author)

B20BS4061	ADVANCED COMPUTER NETWORKS	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This course covers a set of advanced topics in computer networks. The focus is on principles, architectures, and protocols used in modern networked systems, such as the Internet itself, wireless and mobile networks, high performance networks and data center networks.

PRE-REQUISITE:

- Basic knowledge about computer communication network design, operations and implementation.

COURSE OBJECTIVES:

In this course students will be able to

- Identify and work on different routing protocols
- Propose knowledge of Internetworking
- Describe different types of routing mechanisms
- Describe the Transport layer protocols and its functionality.
- Understand motivation, parameters and Functions of Quality of service.

COURSE OUTCOMES:

- To master the fundamentals of data communications and networks by gaining knowledge of data transmission concepts.
- Analyze the computer network with suitable network protocols and routing algorithms.
- Analyze different routing protocols and traffic engineering methods deployed in networking.

COURSE CONTENT:

UNIT I Transmission Networks [10 Hours]

Introduction, PDH Networks, SONET/SDH Networks, DWDM Network, Wireless Transmission: Wireless media, Wireless Systems, Spread Spectrum Technology.

UNIT II Routing and Internet Protocol [10 Hours]

Routing, Static routing, Dynamic routing, Distance Vector Routing Algorithm, Link State Routing, Open Shortest Path First Routing protocol. Address types of the TCP/IP stack, IP Address format, IPv4 Packet Format, Hierarchical Addressing, Sub netting, ICMP, IPv6, Introduction to SDN, VXLAN, GRE and VPN.

UNIT III End-To-End Protocols

[10 Hours]

Simple De-multiplexer(UDP), Reliable Byte Stream(TCP), Remote Procedure Call, Congestion Control and Resource Allocation-Issues in Resource Allocation, Queuing Disciplines, TCP Congestion Control.

UNIT IV Quality Of Service

[10 Hours]

Motivation for QoS, Parameters, Functions required for supporting QoS, Traffic Control, Leaky Bucket algorithm, Token Bucket Algorithm, Explicit Congestion Notification (ECN), Resource Reservation Protocol(RSVP).

Text Books:

1. Computer Networks, Natalia Olifer, Victor Olifer, First Edition, John Wiley, 2015
UNIT-1: Chapter 10, 11
2. Larry & Peterson & Bruce S Davis; Computer networks-A System Approach, 5th Edition, Elsevier Inc, 2014. Chapter 4,5,6.
3. Data Communications and computer Network, Prakash C Guptha, Second Edition, PHI learning Pvt Ltd, Nov 2014. Chapter 23.

Reference Books:

1. "Introduction to Data Communication & Networking" Behrouz Ferouzan, 5th Edition, Mc Graw Hill Education Pvt Ltd 2013
2. Andrew S Tanenbaim, "Computer Networks", Pearson Education, 5th Edition, Elsevier Inc, 2014.

B20BS4062	CYBER PHYSICAL SYSTEMS	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This course introduces the principles, tools, models, and processes essential to cyber-physical system development, such as model-based development methods, basics of feedback for task scheduling, modern verification, and validation techniques, and their integration in today's industrial development processes.

PRE-REQUISITE:

- Knowledge of intermediate programming concepts and basic information security concepts

COURSE OBJECTIVES:

- To develop an understanding of the underlying principles behind integration of computation (software), networking and physical processes to design useful engineering systems.
- It primarily deals with effective orchestration of software and physical processes.

COURSE OUTCOMES:

- Learn the fundamental concepts of security attacks, explore the security keys using cryptographic algorithms.
- 2 evaluate the security policies and practices using security technologies and develop security related applications.
- Explore and interpret cybercrime and cyber offenses according to Indian IT Act 2000.
- Comprehend values and ethics to be followed by cyber experts in area of cybercrime and cyber security.

COURSE CONTENT:

UNIT I

[10 Hours]

Foundations of Cyber Physical Systems, Modeling Dynamic Behaviours, Continuous Dynamics: Properties of Systems, Feedback Control, Discrete Dynamics: The notion of state, Finite-State Machines, Extended State Machines, Hybrid Systems, Composition of State Machine, Concurrent

Models of Computation.

UNIT II

[10 Hours]

Models of sensors and actuators, Common Sensors, actuators, Embedded Processors, Types of Processor, Parallelism, Memory Technologies,

UNIT III

[10 Hours]

Input and Output, Real-Time Task Scheduling. Types of Real-Time tasks and their characteristics. Multitasking, Different Task Scheduling algorithms

UNIT IV

[10 Hours]

Analysis and verification: Invariants and temporal logic, Equivalence and refinement, reachability analysis and model checking, Quantitative analysis, Security and Privacy, applications of Cyber Physical Systems

Text Books:

1. E. A. Lee and S. A. Seshia, Introduction to Embedded Systems - A Cyber-Physical Systems Approach, Second Edition, MIT Press, 2017.
2. R.Mall, Real Time Systems: Theory and Practice, Pearson Education, 2007.

B20BS4063	THE INTERNET OF THINGS	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

PRE-REQUISITE:

- General knowledge of networking, sensing, databases, programming, and related technology.

COURSE OBJECTIVES:

- Discuss the basics of things in IoT
- Identify different IoT applications and their application areas.

- Explain the emerging field of wireless sensor networks, which consist of many tiny, low-power devices equipped with sensing, computation, and wireless communication capabilities.
- Describe operating systems, radio communication, networking protocols.

COURSE OUTCOMES:

- Create the IoT applications with the help of IoT enabled Technologies
- Sketch protocols for IoT Applications
- Analyze low-power devices equipped with sensing, computation, and wireless communication capabilities.
- Describe the operating systems, radio communication, networking protocols

COURSE CONTENT:

UNIT I Introduction to Internet of Things

[10Hours]

Definition & Characteristics of IoT, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks , Communication Models, ,IoT Enabling Technologies,Wireless Sensor Networks, Cloud Computing , Big Data Analytics, Communication Protocols **Domain Specific IoTs** : Home Automation, Smart Cities, Smart Surveillance, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle

UNIT II Overview of Wireless Sensor Networks & Architecture

[10 Hours]

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks. Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III Networking Sensor

[10 Hours]

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols-Energy-Efficient Routing, Geographic Routing.

UNIT IV Advanced topics in IoT

[10 Hours]

Logical Design of IOT using Python, Introduction to Python, Basics of Programming with Raspberry PI with PYTHON, IOT Physical devices and end points. Python Packages of Interest for IoT-JSON. IoT Physical Servers & Endpoints, Introduction to cloud storage Models for IOT.

Text Books:

1. Internet of Things-An Hands on Approach- Vijay Madiseti (Author), ArshdeepBahga, 2014. (Chapter 1, 2, 5)
2. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 1st edition, 2005. (chapter 1 -5)

References Books:

1. FrancisDaCosta, Rethinking Internet of things, Apress Open Edition, 2013

- Adrian McEwen, Hakim Cassimally, Design of Internet of Things, 2014 John Wiley and Sons, Ltd.

B20BS4071	PROGRAMMING WITH RUBY & GOLANG	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This course starts with the basics of Ruby programming, including operators, variables and conditional statements. Intermediate and advanced concepts in Ruby with practical, hands-on application and examples every step of the way. This course, provides the understand the basic syntax and control structures of the language as well as how to apply Go's concurrency model to build massively parallel systems grasp the purpose of types which is especially important if you're coming from a dynamically typed languages like JavaScript or Ruby.

PRE-REQUISITE:

- Need to have basic knowledge in C, C++ (or Java) programming languages

COURSE OBJECTIVES:

The objective of this course is to:

- Provide Storage foundational knowledge of Software programming using Ruby
- learn the basic syntax and semantics of the ruby language and programming environment
- ruby on rails
- interactive with databases

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Ability to write programs using ruby
- Develop web application in Ruby and connect to database and Understand how to connect ruby application with backend database
- Understand the fundamentals of Go programming language.
- Creating and compiling a Go workspace

COURSE CONTENT:

UNIT I Foundations and core of Ruby

[10 Hours]

Bootstrapping Your Ruby Literacy, Objects, methods, and Local variables, Organizing objects with classes, Modules and Program organization, The default object (self) ,scope and visibility ,and control flow techniques, Built in essentials , strings, symbols, scalar objects, Collection of container objects, collection central : Enumerable and Enumerator, Regular expression , File and I/o operations , callbacks, hooks, and Runtime Introspection

UNIT II Ruby testing & Ruby on rails

[10 Hours]

A test driven fible, Test driven development basics, test driven rails, What makes great tests, Adding data to tests, setting up cucumber, Integration testing with cucumber , unit testing using java scripts, Getting started with ruby on rails, Develop and design UI/UX, the frontend interface, ,frontend styling and production deploy , Add signup forms, add admin user functionality , Testing for security, adding user, roles, troubleshooting and debugging

UNIT III Go and the Operating System

[10 Hours]

Where is Go going? The advantages of Go,Compiling Go code, Executing Go code,Two Go rules, Downloading Go packages, UNIX stdin, stdout, and stderr, About printing output, Using standard output, Getting user input, About error output, Writing to log files Error handling in Go, Using Docker, Understanding Go Internals, The Go compiler, Garbage collection, Calling C code from Go, Calling Go functions from C code, The defer keyword, Two handy UNIX utilities, Your Go environment, The go env command, The Go assembler, Node trees, Creating WebAssembly code

UNIT IV

[10 Hours]

Working with Basic Go Data Types,Numeric data types, Go loops, Go arrays, Go slices, Go maps, Go constants, Go pointers, Times and dates, Measuring execution time, The Uses of Composite Types 1About composite types Structures, Tuples, Regular expressions and pattern matching, Strings The switch statement, Calculating Pi with high accuracy, Developing a key-value store in Go, Go and the JSON format

Text Books:

1. the-well-grounded-rubyist-second-edition
2. Rails-Test-Prescriptions-Healthy-Codebase
3. Build Your Own Ruby on Rails Web Applications 1st Edition by Patrick Lenz (Author)
4. Mastering GO by Mihalis Tsoukalos 2nd Edition.

Reference Books:

1. Web docs : <https://www.tutorialspoint.com/ruby>

B20BS4072	INTRODUCTION TO WEB PROGRAMMING	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This course is designed to provide the student with foundational programming knowledge and skills for application development on the Internet. HTML is the programming language used to develop home pages on the Internet. This course covers the most current tools available for developing HTML documents and posting pages on the World Wide Web. Also, the course covers CSS to design the pages with varied styles. It provides deep knowledge on Java Script as client-side scripting language.

PRE-REQUISITE:

- To get started with web technology you should have the basic knowledge of Computer fundamentals.

COURSE OBJECTIVES:

The objectives of this course are to:

- Describe rich internet applications that use most recent client-side programming technologies.
- Apply client-side validations using Java Script.
- Capture core technical skills necessary for a complete understanding of front-end web development, including HTML5 and CSS, JavaScript, DOM.

COURSE OUTCOMES:

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

- Understand the fundamental concepts of HTML and XHTML scripting tools
- To Learn and implement the programming concepts of CSS and Java Script
- Understand the principles of creating an effective web page
- Design and develop web applications using the web technology tools

COURSE CONTENT:

UNIT I Fundamentals of Web

[13Hours]

Fundamentals of Web: A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The Hypertext Transfer Protocol. Introduction to XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Syntactic Differences between HTML and XHTML.CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Color, Alignment of Text, The Box Model, Background Images, The and <div> Tags,

UNIT II HTML 5

[13Hours]

Detecting HTML5 features – Canvas, Video, Local Storage, Web Workers, Offline Applications, Geolocation, Placeholders and input types, What Does It All Mean–Doctype, Root, Headers, Articles, Dates and Times, Navigation and Footers. Simple Shapes, Canvas, Paths, Texts, Gradients and Images. A Form of Madness– PlaceHolders, Autofocus Fields, Email, and Numbers AsSpinboxes and Sliders.

UNIT III JavaScript and XHTML Documents

[13 Hours]

The Basics of JavaScript: Overview of JavaScript, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives Operations and ExpressionsJavaScript: Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Pattern Matching Using Regular Expressions, Errors in Scripts. The Document Object Model, Element Access in JavaScript, Events and Event Handling. Handling Events from Body Elements, Handling Events from Button Elements, Handling Events from Text Box and Password Elements, The DOM 2 Event Model. Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility

UNIT IV Introduction to Angular -JS and Introduction to XML

[13 Hours]

ANGULAR JS: UnderstandingjQuery,Event Manipulation Methods, AngularJS Template & live data binding,Struts architecture & versions

Introduction, Syntax of XML, XML document structure, Document Type Definitions, Namespaces, XML Schemas, Displaying Raw XML Documents with CSS. XSLT Style Sheets: Overview of XSLT, XSL Transformations for Presentation, XML Processors.

Text Books:

1. Robert W Sebesta, “Programming the World Wide Web”, 4th Edition, Pearson Education, 2008. (Chapters: 1, 2, 3, 4, 5 and 6)
2. Achyut S. Godbole and AtulKahate, Web Technologies, Tata McGraw Hill, 2003.
3. Jason Hunter, William Crawford, Java Servlet Programming, O’Reilly Publications, 1998.

Reference Books:

1. M.Deitel, P.J.Deitel, A.B.Goldberg, “Internet & World Wide Web How to program”, 3rd Edition, Pearson Education / PHI, 2004.

2. Chris Bates, “Web Programming Building Internet Applications”, 3rd Edition, Wiley India, 2006.
3. XueBai et al, “The Web Warrior Guide to Web Programming”, Thomson, 2003.
3. Sklar, “The Web Warrior Guide to Web Design Technologies”, 1st Edition, Cengage Learning India.

Web Programming Laboratory

PART-A

1. Create an HTML5 page to demonstrate the usage of
 - a. Text Formatting tags
 - b. Links
 - c. Images
 - d. Tables
2. Develop and demonstrate the usage of inline and external style Sheet using CSS.
3. Write a Program using JavaScript to display a table of the numbers from 5 to 15 and their squares and cubes using alert.
4. Develop and demonstrate using Java script, a XHTML document that display random numbers (integers).
5. Program to demonstrate various event handlers when an image is moved from the top stacking position, it returns to its original position using JavaScript.
6. Develop using Java script, an XHTML document that use of on load and on focus events.
7. Program on xml to read Employee details and display the details using CSS.
8. Develop a web form to display the student details using XML and XSLT style sheets.

PART-B

1. Build a client-side web application in the following areas:
 - a. Educational Institutions.
 - b. Online shopping.
 - c. Hospital Management System.
 - d. Real Estate.
 - e. Reservation System

B20BS4073	JAVA PROGRAMMING	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This intensive, hands-on course explores advanced Java Standard Edition language features and packages. Multi-threaded applications will be covered in detail including concepts such as deadlocks

and race conditions. Students will also learn how to utilize more advanced I/O capabilities with object serialization and low-level file I/O with the java.nio package. Client/server applications will be written utilizing both the java.net and java.rmi packages

PRE-REQUISITE:

- To learn Java, you must have a basic understanding of the C/C++ programming language.

COURSE OBJECTIVES:

- To provide Storage foundational knowledge of Software programming using core Java and advanced java
- To learn the basic syntax and semantics of the Java language and programming environment using if loops with while, for and do statements
- To understand the concepts of classes and objects

COURSE OUTCOMES:

On completion of this course the student will be able to:

- Ability to write programs using java.
- Develop simple web application using java and connect to database to store student Information

COURSE CONTENT:

UNIT I Java Foundation

[15 Hours]

Origin of Java, Object oriented programming, Java development kit, Write and run your first simple java program, Data Types and Operators and Program control statements, Class fundamentals, defining class, Methods, and objects, data type and operators ,arrays, string, Bitwise operators

UNIT II Java Object Oriented program and Java E HTML5

[13 Hours]

Basics of Inheritance, constructors, defining packages and member access, Exception hierarchy, using try and catch. JAVA EE 7 HTML5 PRODUCTIVITY, Java EE 7, Enhanced HTML5 support, Java EE 7 architecture, Java EE Platform, A working example.

UNIT III Advanced Java

[13 Hours]

Java –Data structures, Collections, Generics, networking, Java sending email, Java multi-threading , Java DB connection ,Java Scripting GUI Programming in Java: Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, AWT Components

UNIT IV Basics of Servlet

[13 Hours]

Servlet, Basics of Web Servlet API, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, Working with Apache Tomcat Server, Steps to create a servlet in Tomcat, How servlet works? servlet

in Netbeans

Text Books:

1. Java: A Beginner's Guide(Paperback) by Herbert Schildt
2. Java EE 7 Developer Handbook by Peter A. Pilgrim

B20BS4080	PUBLIC CLOUD –AWS,AZURE AND GOOGLE LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. Azure Windows and Linux Virtual machine create, connect ,stop and delete
2. Deploy IIS and Apache2 web server on win/Linux vm respectively
3. Create Azure Load balancer
4. Perform Azure VM autoscaling
5. Azure blob storage
6. Google cloud Windows and Linux Virtual machine create, connect ,stop and delete
7. Deploy IIS and Apache2 web server on win/Linux vm respectively
8. Create Google Load balancer
9. Perform Google cloud VM autoscaling
10. Google cloud storage (create buckets, store and retrieve data)
11. AWS cloud Windows and Linux Virtual machine create, connect ,stop and delete
12. Deploy IIS and Apache2 web server on win/Linux vm respectively
13. Create AWS Elastic Load balancer
14. Perform AWS cloud VM autoscaling
15. AWS s3 (create buckets, store and retrieve data)
16. VM snapshots and recovery on three cloud providers
17. Volume backup and recovery on three cloud providers

B20BS4090	CLOUD DEVELOPER TOOLS AND ECOSYSTEMS LAB	L	T	P	C
Total Hours: 26		0	0	2	2

LAB EXPERIMENTS:

1. Kuberenetes minkube installation
2. Kubernetes namespaces, configmap and secret
3. Kuberenetes pod deplyments
4. Kubernetes rolling update and rollback
5. Perform liveliness probes in kubernetes
6. Kuberenetes other operations
7. Deploy app on AWS ec2 , beanstalk, and ECS
8. Deploy app on aws ec2 and connect to aws RDS instance
9. Perform static web hosting on s3 and object versioning
10. Aws s3 cors config
11. Deploy app on Google clodu compute engine, app engine and GKE
12. Deploy app on compute engine and connect to CLOUD-SQL
13. Deploy app on container and connect to CLOUD-datastore
14. Create repositories on google cloud CSR
15. Deploy apps on Cloud foundry using java, ruby, node.js and python apps
16. Scale application on cloud foundry
17. Perform clodu foundry cli iperations
18. Deploy apps on openshift
19. Scale application on openshift
20. Perform openshift cli operations

B20BS4100	SOFT SKILLS
Total Hours: 30	

B20BS4110	SKILL DEVELOPMENT PROGRAM
Total Hours: 32	

FIFTH SEMESTER

Sl.No	Code	Title	HC/ SC/ FC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS5010	Building Private Cloud with Open Stack	HC	3	0	0	3	3
2	B20BS5020	Big Data Analytics using Hadoop	HC	2	0	1	3	5
3	B20BS5030	Machine learning foundation with Python	HC	3	0	1	4	5
4	B20BS5041	Public Cloud Networking And Security	SC	2	0	1	3	4
	B20BS5042	C# and .NET						
	B20BS5043	Advanced JAVA for Micro-services architecture						
5	B20BS5051	Cyber Security	SC	3	0	0	3	3
	B20BS5052	Cloud APP development						
	B20BS5053	Cloud Migration and Disaster recovery						
6		Open Elective	OE	4	0	0	4	4
Practical Courses								
7	B20BS5070	Building Private Cloud with Open Stack Lab	HC	0	0	2	2	4
8	B20BS5080	Minor Project	HC	0	0	3	3	6

***Mandatory - (Non Creditable Courses)**

9	B20BS5090	Soft skills						
10	B20BS5100	Skill Development Program						
Total Credits			17	0	8	25	34	

Open Elective Courses offered to other Schools

Sl. No	Code	Title	HC/SC/OE	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS5061	Fundamentals of Cloud Computing	OE	4	0	0	4	4
2	B20BS5062	Basics of Data Analytics						

B20BS5010	BUILDING PRIVATE CLOUD WITH OPEN STACK	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This Course will get you started with Open Stack, showing you how to build and operate a virtual computing environment and deploy Open Stack to build a private cloud.

PRE-REQUISITE:

- Knowledge on operating system virtualization, Ubuntu basics, computer network services

COURSE OBJECTIVES:

- Build Open Stack private cloud while leveraging and integrating KVM virtualization technology to spin cloud instances /VM's

COURSE OUTCOMES:

- Ability to deploy Open Stack single node on Centos and ubuntu
- Ability to deploy Open Stack multi node on Centos
- Ability to deploy Open Stack multi node on ubuntu
- Perform Openstack cloud operations on compute, storage and network

COURSE CONTENT:

UNIT I Open Stack ecosystem introduction Single node OpenStack-KVM on ubuntu [10 Hours]

OpenStack ecosystem, components and its role in OpenStack, OpenStack architecture, Deploying Ubuntu server and installing nova, glance, neutron, cinder keystone and build private cloud on single machine . Deploying Centos 7 or above and installing nova, glance, neutron, cinder keystone and build

private cloud on single machine

UNIT II OpenStack Multinode setup on Ubuntu KVM [10 Hours]

OpenStack Installation Module, Deployment Planning for OpenStack, Ubuntu Server Installation, Network and Disk Partitioning on Linux , NTP Server Installation and Configuration, MySQL Server – Theory and Lab, OpenStack Keystone Module – Theory and Lab, Create Keystone users ,tenants, and roles, OpenStack Glance -An Overview, and create linux Glance images, Cinder Module – Theory and Lab, Neutron services – Theory and Lab, Nova services – Theory, and lab , Horizon Module – Theory and Lab, OpenStack CLI operations

UNIT III Single node OpenStack-KVM on Centos7 [10 Hours]

OpenStack ecosystem, components and its role in OpenStack, OpenStack architecture, Deploying Ubuntu server and installing nova, glance, neutron, cinder keystone and build private cloud on single machine . Deploying Centos 7 or above and installing nova, glance, neutron, cinder keystone and build private cloud on single machine

UNIT-IV: Centos 7 - OpenStack Multinode setup [10 Hours]

OpenStack Installation Module, Deployment Planning for OpenStack, Ubuntu Server Installation, Network and Disk Partitioning on Linux , NTP Server Installation and Configuration, MySQL Server – Theory and Lab, OpenStack Keystone Module – Theory and Lab, Create Keystone users ,tenants, and roles, OpenStack Glance -An Overview, and create linux Glance images, Cinder Module – Theory and Lab, Neutron services – Theory and Lab, Nova services – Theory, and lab , Horizon Module – Theory and Lab, OpenStack CLI operations both Hosts, Install nova-compute with installer

Text Books:

1. OpenStack Cloud Computing Cookbook, 2nd Edition ,By Kevin Jackson, Cody Bunch
2. OpenStack Cloud Computing: Architecture Guide by John Rhoton, Jan De Clercq

Reference guides/Links for labs

1. <http://docs.OpenStack.org>
2. <http://docs.OpenStack.org/admin-guide-cloud/content/>

B20BS5020		L	T	P	C
Total Hours: 52	BIG DATA ANALYTICS USING HADOOP	2	0	1	3

COURSE DESCRIPTION:

The 'Introduction to Big Data and Hadoop' is an ideal course to understand the basic concepts of Big Data and Hadoop. On completing this course, learners will be able to interpret what goes behind the processing of huge volumes of data as the industry switches over from excel-based analytics to real-time analytics. The course focuses on the basics of Big Data and Hadoop. It further provides an overview of the commercial distributions of Hadoop as well as the components of the Hadoop ecosystem.

PRE-REQUISITE:

- To know the concepts of data analytics you should have some basic knowledge in Programming languages, Algorithm and Data Structure, Database concepts, and Strong knowledge in statistics and mathematics.

COURSE OBJECTIVES:

The objective of this course is to:

- Understand Hadoop basics and perform Hadoop administration

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Get a strong foundation knowledge about Hadoop
- Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce
- Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues
- Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

COURSE CONTENT:

UNIT I Hadoop Foundation

[13Hours]

Motivation for Hadoop /Big Data, Hadoop concepts, hdfs, getting started with Hadoop frameworks and Hadoop Installation checking the pre-requisites, install Hadoop on local Ubuntu machine, download Hadoop, configuring and running Hadoop, understand three modes of Hadoop, configuring the base directory of Hadoop, formatting the name node, starting Hadoop, using HDFS, run your first Program Hello world of MapReduce, Monitoring Hadoop from the web browser, YARN, Hadoop I/o Chapter 1-5 (Hadoop-The.Definitive.Guide_4.edition_a_Tom.White_April-2015.pdf)

UNIT-II: MapReduce and Hadoop ecosystem:

[13Hours]

13 HOURS

Developing a MapReduce program, setting up the development environment, writing a unit test with MRunit, MapReduce workflows, How MapReduce works, Failures ,MapReduce types and format, MapReduce features, Pig, Hive, spark and Flume concepts and hands on lab
Chapter 6-9 (Hadoop-The.Definitive.Guide_4.edition_a_Tom.White_April-2015.pdf)

UNIT-III : Bigdata on Amazon Web Service cloud and azure cloud [13Hours]

What is AWS Elastic MapReduce, the EMR Architecture, EMR use cases, Programming Hadoop on AWS EMR, Hello world , mapper implementation, reducer implementation, driver implementation, Executing Hadoop jobs on AWS EMR,,: creating EC2 key pair and S3 bucket, how to launch EMR cluster, viewing results. AWS EMR cluster management, monitoring and troubleshooting, EMR best practices, EMR launch, monitor EMR cluster via Command line ,Hadoop streaming and Advanced customization on EMR. Introducing HDInsight ,Understanding Windows Azure HDInsight Service, Provisioning Your HDInsight Service Cluster, Automating HDInsight Cluster Provisioning, Submitting Jobs to Your HDInsight Cluster ,Exploring the HDInsight Name Node ,run hive and spark jobs on azure hd insight

UNIT-IV: Bigdata on Google cloud [13Hours]

Google cloud DataProc introduction, deploy Dataproc cluster, connect to master node, run hive and spark programs, Google cloud storage bucket operations, Google cloud Dataflow ,stream data processing on dataflow , Bigquery, import datasets to bigquery and run queries on Google cloud bigquery platform, Bigtable concepts and architecture, Store data and analysis of data on bigtable

Text books:

1. Pro Apache Hadoop Paperback – September 10, 2014 by Jason Venner (Author), Sameer Wadkar (Author), Madhu Siddalingaiah (Author)
2. Hadoop Beginner's Guide Paperback – February 22, 2013 by Garry Turkington (Author)

Reference Books:

1. Pro Apache Hadoop Paperback – September 10, 2014 by Jason Venner (Author), Sameer Wadkar (Author), Madhu Siddalingaiah (Author)
2. Hadoop Beginner's Guide Paperback – February 22, 2013 by Garry Turkington (Author)

LAB EXPERIMENTS

1. Setup single node Hadoop cluster
2. Setup multi node Hadoop cluster
3. Run Hadoop sample jobs
4. Install configure Hive perform analytics
5. Install and configure Spark and perform simple job
6. Install and work on Spark
7. Deploy AWS EMR cluster and run Hadoop, hive and spark jobs
8. Deploy Azure HDinsight cluster and run Hadoop, hive and spark jobs
9. Deploy Google cloud Dataproc cluster and run Hadoop, hive and spark jobs
10. Import datasets on Bigquery and run sql queries
11. Store and retrieve data from Bigtable

B20BS5030	MACHINE LEARNING FOUNDATION WITH PYTHON	L	T	P	C
Total Hours: 52		3	0	1	4

COURSE DESCRIPTION:

This course gives knowledge about how to use control statements. Understand how to use loops to iterate over objects or data for accurate results. Write encapsulated and succinct Python functions. Manipulate files on the file system (open, read, write, and delete). Gain insight into the difference between supervised and unsupervised models. Study popular algorithms, such as K-means, Gaussian Mixture, Birch, Naïve-Bayes, Decision Tree, and SVM

PRE-REQUISITE:

- To get started with Machine Learning you must be familiar with Statistics,
- Calculus, Probability and Programming Languages

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.

COURSE OUTCOMES:

- Ability to understand machine learning
- Understand popular tools in machine learning
- To understand basics of artificial Intelligence and Machine Learning
- Using Python libraries for implementing Machine Learning models.

COURSE CONTENT:

UNIT I ML concepts Foundation

[13Hours]

Evolution of Machine Learning , Define Machine Learning (ML) ,Define Supervised Learning , Define Un-Supervised Learning , Define reinforcement learning, Define Semi-supervised Learning , Define Federated Learning, Machine Learning in Banking and Finance Industry, Machine Learning in Healthcare, Machine Learning in Transportation, Machine Learning in Government, Machine Learning in Media and entertainment

UNIT II ML Program foundation

[13Hours]

Data Types (Numerical, categorical and Ordinal), Just enough Python for ML ,Lab : Simple python exercise, Introduction to NumPy and simple lab on numpy, Introduction to SciPy and simple lab on Scipy , Introduction to Pandas and simple lab exercise, Introduction to Matplotlib and simple lab exercise

UNIT III AI Foundation

[13Hours]

Understand concepts of AI, Deep Learning and NLP, **Classification Lab** – Classify images using Tensorflow and visualise using Matplotlib **Clustering Lab** – Customer segmentation, **Regression Lab** – Predict pricing of house Scikit-learn NumPy and Pandas, **Recommendation Lab** – Provide recommendations using Natural Language Processing using live data of training services company (using Nltk tool kit),

UNIT IV ML Advanced Models Programming

[13Hours]

Sentiment Analysis Lab – Movie review (Positive or negative) using Natural Language Processing, **Reinforcement Learning Lab** – Place agent in one of the room and goal is to reach outside the building, **Association Lab** – Perform Market basket analysis for e-commerce, Tensor flow labs on sample data from public datasets

Lab Experiments

1. Numpy lab exercises
2. Scipy lab exercises
3. Matplotlib lab exercises
4. Classification Lab – Classify images using Tensorflow and visualise using Matplotlib
5. Clustering Lab – Customer segmentation,
6. Regression Lab – Predict pricing of house Scikit-learn NumPy and Pandas, Recommendation Lab – Provide recommendations using Natural Language Processing using live data of training services company (using Nltk tool kit),
7. Sentiment Analysis Lab – Movie review (Positive or negative) using Natural Language Processing,
8. Reinforcement Learning Lab – Place agent in one of the room and goal is to reach outside the building,
9. Association Lab – Perform Market basket analysis for e-commerce.

B20BS5041	PUBLIC CLOUD NETWORKING AND SECURITY	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

The course will describe the Cloud security architecture and explore the guiding security design principles, design patterns, industry standards, applied technologies and addressing regulatory compliance requirements critical to design, implement, deliver and manage secure cloud based services.

PRE-REQUISITE:

- Having basic knowledge of operating systems like Windows OS, Linux etc. and Virtualization, Networking are an essential.

COURSE OBJECTIVES:

- Understand how networking and security is managed in Google cloud
- Understand how networking and security is managed in AWS cloud

COURSE OUTCOMES:

- Ability to understand and Networking in AWS cloud
- Ability to understand and security in AWS cloud
- Ability to understand and Networking in Google cloud
- Ability to understand and security in Google cloud

COURSE CONTENT:

UNIT I AWS Networking

[13 Hours]

AWS Cloud - Virtual Private Cloud concepts, private and public Subnets, route tables ,NAT gateways, Internet gateways , VPC endpoints, Elastic IP address, Elastic network interfaces, VPC Peering with region and VPC peering across regions, Transit VPC, AWS Direct connect concepts, AWS Route 53 concepts and record sets, Elastic load balancers, Cloudfront distribution with s3 bucket, VPC cloud formation templates

UNIT II AWS Security

[13Hours]

AWS Security best practices , Shared security model , Logging and Monitoring like s3 events, CloudWatch logs, AWS config, AWS Inspector, CloudTrail logging, VPC flow logs, CloudWatch ec2 agent logs, s3 access logs. Infrastructure security of CloudFront, Signed URL, CloudFront geo restrictions , Web application firewall and AWS shield , VPC NACLs and security groups , IAM Policies for s3 bucket level policies and ec2 instance policies, key management services, Data at rest encryption.

UNIT III Google Cloud Networking**[13Hours]**

Google Cloud - Virtual Private Cloud concepts, Subnets, route ,NAT gateways, Internet gateways , Static IP address, VPC Peering with region and VPC peering across regions, VPC peering across projects, Google cloud interconnect options, Cloud DNS concepts and record sets, Global and regional load balancers, VPC deployment using deployment manager

UNIT IV Google Cloud Security**[13Hours]**

Google cloud Resource manager, Google Cloud IAM, service accounts, Shared VPC, Data encryption in Google cloud, Google cloud Key management service, Cloud Armor, Cloud security scanner, Compute engine and Kuberentes engine security, cloud storage access permissions, Stackdriver monting and logging of compute engine vms, Google shared security responsibility model , Google cloud data centre compliance certifications

Lab Experiments

1. Create a private load balancer add & run ec2 vm in private subnet
2. Create a aws vpc peering and add nacl rules
3. Configure aws cloud watch logs agent on ec2 vm
4. Configure aws cloud trial for one of the region
5. Setup aws cloudfront distribution and setup geo restrictions
6. Configure s3 bucket level policy
7. Configure google vpc peering within and across projects
8. Configure data encryption in google cloud
9. Use key management service in google
10. Configure stackdriver logging agent on compute engine vms
11. Configure stackdriver monitoring agent on compute engine vms

Text Books:

1. Learning Windows Azure Paperback – October 16, 2014, by Geoff Webber-Cross
2. Implementing Microsoft Azure Infrastructure Solutions, By Michael Washam, Rick Rainey
3. Programming Amazon Web Services: S3, EC2, SQS, FPS, and SimpleDB Paperback ,by James Murty
4. Google Cloud Platform for Architects: Design and manage powerful cloud solutions Kindle Edition by Vitthal Srinivasan (Author), Janani Ravi (Author), Judy Raj (Author)

B20BS5042	C# and .NET	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This course will cover the practical aspects of multi-tier application development using the.NET

framework. The goal of this course is to introduce the students to the basics of distributed application development. Technologies covered include the Common Language Runtime (CLR), .NET framework classes, C#,ASP.NET, and ADO.NET.

PRE-REQUISITE:

- Need to have knowledge on C, basic algorithm, computing concepts such as statement, expression, operand, operator etc and pseudo code.

COURSE OBJECTIVES:

- To learn the basic concepts of .NET Framework
- To learn the concepts of object oriented programming using C#.NET
- To get the knowledge on the windows programming using C#.NET
- To get the knowledge on the ADO.NET
- To get knowledge on the basic concept of ASP.NET

COURSE OUTCOMES:

- Will Understand .Net Framework and Describe some of the major enhancements to the new versions of C#
- Design the Basic structure of C# for Various programming Technologies
- Evaluate user requirements for software functionality required to decide whether the programming language C# can meet user requirements Analysis
- propose the use of certain technologies by implementing them in the C# programming language to solve the given problem

COURSE CONTENT:

UNIT I .NET Framework 4.0

[13Hours]

Introduction to the .NET Platform , Common Language Runtime(CLR) , The Common Type Specification(CTS) , The Common Language Specifications (CLS) ,Interoperability, Assemblies , Shared Assemblies, Private Assembles, GAC .NET Base Classes , CLR Debugger, Deployment of .net applications, Hallo world console application using c#, Visual studio IDE, Introduction to C# , Data Type, Operators, Flow Control and Iteration , Arrays and Strings, Basics of C# Classes, Members of the Class, Reference Types and Value Types, Boxing and Unboxing, Reflection, The Preprocessors, Name Spaces.

UNIT II Object Oriented Programming in C#

[13Hours]

Object-Oriented Programming in C#, Encapsulation, Inheritance , and Polymorphism, Interfaces, Introduction to .NET Collections (including Custom Collections) ,Generic Programming, Custom Indexers, Exception Handling, Garbage Collection , Input and Output (Directories ,Files, and Streams) Delegates and Events- Type Reflection and Attributes, Operator Overloading ,Expression and operations: using the?? (Null Coalescing) Operator, using the :(scope resolution) operator and using the is and as operator.

UNIT III Data Access with ADO.NET

[13Hours]

Windows Programming: Windows Forms, Handling Events on Tools(buttons, Textboxes, Radio

buttons, combo boxes, Grid and List Views, Date Picker, List box, etc...). ADO.NET: Connected and Disconnected Data modal, Creating Table from Application, Inserting, Deleting and Updating Database, Executing Stored Procedures.

UNIT IV Web Applications Using ASP.NET

[13Hours]

Web Application: Creating web page with navigations using Site map and menu strip, Creating and Applying Master page, understanding of state management by using sessions, cookies, view state and application object. Validates, Deployment of an ASP.NET webpage in IIS7.

Text Books:

1. C# 2012 Programming, Covers .Net 4.5, Black Book: Kogent Learning Solutions
2. Pro C# 5.0 and the .NET 4.5 Framework (Expert's Voice in .NET), Andrew Troelsen, Sixth Edition, Apress publishers.

Reference Books:

1. Professional C# 5.0 And .Net 4.5.1 by Christian Nagel , Jay Glynn, Morgan Skinner

B20BS5043	ADVANCED JAVA FOR MICRO-SERVICES ARCHITECTURE	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This course provides the deep understanding of the core JAVA micro services concepts and framework: provide Knowledge on setting up the development environment and configuring it before implementing continuous integration to deploy micro services architecture.

PRE-REQUISITE:

- Basic knowledge of java programming, business models and service oriented

COURSE OBJECTIVES:

- The objective of this course is to familiarize students with microservice and its build.

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Understand Microservices concepts and principle with insight in how they have evolved.
- Understand microservices architecture.
- Use Spring boot for microservices

- Use Spring Cloud for microservices.

COURSE CONTENT:

UNIT I Introducing Microservices [13Hours]

Independent modules, intermodule communication, e-commerce microservice, understanding self-contained microservices, message oriented microservices, advanced microservices.

UNIT II Micro service architecture [13Hours]

Mesh app and Service architecture, classify services, Domain centric partitions, inner architecture of microservices, CQRS., distributed messaging.

UNIT III [13Hours]

Spring boot – Spring initializer, Spring boot starter, spring boot dependencies, maven plugin, running & testing the Spring boot application, spring HAL browsers , HATESOA, REST controller

UNIT IV [13Hours]

Spring Cloud – Feign client, Coding, Build and test, Hystrix fallback, dashboard, Ribbon, Eureka.Zuul API gateway.

Textbook:

1. Practical Microservices Architectural Patterns - Event-Based Java Microservices with Spring Boot and Spring Cloud by Binildas Christudas.

B20BS5051	CYBER SECURITY	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This cyber security course introduces students to the basics of the field. Students study monitoring and protection procedures pertaining to security activities and learn to apply them practically. Students examine different tracing methods and identify techniques for their practical use. This course also dives into the very beginnings of cryptography.

PRE-REQUISITE:

- Need to have proficiency with a coding language like JavaScript or SQL and networking.

COURSE OBJECTIVES:

- Explain security concepts, Ethics in Network Security.
- Identify security threats, and the security services and mechanisms to counter them
- Comprehend and apply relevant cryptographic techniques
- Comprehend security services and mechanisms in the network protocol stack
- Illustrate the integrity and authentication process
- Familiarize various cyber threats, attacks, vulnerabilities and defensive mechanisms

COURSE OUTCOMES:

- Relate the cryptographic techniques.
- Explore integrity and authentication process
- Familiarize various cyber threats, attacks, vulnerabilities and defensive mechanisms
- Demonstrate the security policies and practices
- Implement the cryptographic techniques and know the real time applications of various cryptographic techniques

COURSE CONTENT:

UNIT I [10Hours]

Security and Cryptography: Security Trends, Security Services, Security attacks, Security mechanisms, A Model for Network security. A short History of Cryptography, Cryptographic techniques, Symmetric and asymmetric key algorithm, Cryptography Tools, Attacks on Cryptosystems.

UNIT II [10Hours]

Security Technology: Physical design; Firewalls; Protecting Remote Connections, Intrusion Detection Systems (IDS), Honey Pots, Honey Nets.

UNIT III [10Hours]

Cybercrime and cyber offenses: Introduction to Cybercrime and Laws Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and information Security, Cybercriminals, Classifications of Cybercrimes, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cyber offenses: How Criminals Plan the Attacks, Social Engineering, Cyber talking, Cyber cafe and Cybercrimes, Bot nets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT IV [10Hours]

Tools and Methods: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, identity theft. Cybercrimes and Cyber security: The Legal Perspectives, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment.

Text Books:

1. Nina Godbole, SunitBelapur, “CYBER SECURITY UNDERSTANDING CYBER CRIMES, COMPUTER FORENSICS AND LEGAL PERSPECTIVES”, Wiley India Publications, April, 2011.
2. Robert Jones, “INTERNET FORENSICS: USING DIGITAL EVIDENCE TO SOLVE COMPUTER CRIME”, O’Reilly Media, October, 2005.
3. Michael E. Whitman and Herbert J. Mattord, “PRINCIPLES OF INFORMATION SECURITY”, 2nd Edition, Thomson, 2005.
4. William Stallings, “NETWORK SECURITY ESSENTIALS: APPLICATIONS AND STANDARDS”, Pearson Education, 2000.

Reference Books:

1. Marjie T. Britz, “COMPUTER FORENSICS AND CYBER CRIME: AN INTRODUCTION” – Pearson Education.
2. Chwan-Hwa (John) Wu, J. David Irwin, “INTRODUCTION TO COMPUTER NETWORKS AND CYBER SECURITY” - CRC Press

B20BS5052	CLOUD APP DEVELOPMENT	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This course describes Kubernetes and what it is used for, deploy single and multiple container applications on Kubernetes, use Kubernetes services, manage application deployments with rollouts in Kubernetes, ensure container preconditions are met and keep containers healthy, learn how to manage configuration, sensitive, and persistent data in Kubernetes, discuss popular tools and topics surrounding Kubernetes in the ecosystem

PRE-REQUISITE:

- Need a basic understanding of Linux, YAML, and command lines.

COURSE OBJECTIVES:

- The objective of this course is to gain knowledge of developing applications in the cloud

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Develop cloud based applications

- Deploy the application on real cloud
- To analyze and trouble shoot the problems while deploying application on cloud
- Use application based technologies for developing application using cloud
- Use public cloud like IBM Bluemix, Amazon AWS, Google cloud platform or Microsoft Azure for developing an application
- Work with real cloud services

COURSE CONTENT:

UNIT I Cloud Based Applications [10Hours]

Developing web service, Understanding cloud ecosystem- SaaS/PaaS, Popular APIs. Designing Code for The Cloud: Designing cloud infrastructure; Web Browsers and the Presentation Layer- Understanding Web browsers attributes and differences. Building blocks of the presentation layer: HTML, HTML5, CSS, Silver-light, flash, java script, JQuery, Boot Strap

UNIT II Web Development Techniques and Frameworks: [10Hours]

Working with AJAX controls, JQuery, JSON, XML, REST. Working on Application development Frameworks e.g. Ruby on Rails ,.Net, Java API's or JSF; Deployment Environments – Platform As A Service(PAAS) ,Amazon, vmForce, Google App Engine, Azure, Heroku, AppForce

UNIT III Developing and Deploying an Application in the real cloud [10Hours]

Study the design, development, testing and deployment of an application in the cloud using a development framework and deployment platform

UNIT IV Using real cloud services: [10Hours]

Working with compute, Data intensive services, load balancing and scaling services available on real cloud platforms

Text Book:

1. Azure in Action by Chris Hay, Brian Prince
2. Introducing Windows Azure by Henry Li
3. Developing Applications for the Cloud on the Microsoft Windows Azure Platform by Eugenio Pace, Dominic Betts,
4. Developing with Google App Engine by Eugene Ciuran
5. Using Google App Engine by Charles Severance
6. Programming Google App Engine by Dan Sanderson

B20BS5053	CLOUD MIGRATION AND DISASTER RECOVERY	L	T	P	C
Total Hours: 40		3	0	0	3

COURSE DESCRIPTION:

This course will provide an overview of each different method, and how each one balances the competing business needs of high availability and cost optimization. Provides Knowledge on the standard disaster recovery methods, and how a business would select a method based on its service needs. Gives an overview of Cloud Foundry and its tools from the point of view of an application developer and how to architect polyglot applications for deployment and scaling in the cloud.

PRE-REQUISITE:

- Need to have good knowledge of Cloud Computing and Cloud principles

COURSE OBJECTIVES:

- To understand the implementation and design Disaster recovery and business continuity in public clouds with on premise and within public cloud

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Best practices to prepare, deploy and maintain a disaster recovery and business continuity plan
- Different approaches taken by the organization's contingency plan to avoid risks on-site and on cloud

COURSE CONTENT:

UNIT I Cloud BCP and Disaster recovery Concepts [10Hours]

Business continuity concepts, Disaster recovery concepts, Recovery point objective and recovery time objective, On-premise to Public cloud DR solutions, DR solutions with Google cloud using multi regions , DR solutions with AWS cloud using multi regions , DR solutions with Azure cloud using multi regions , DR strategies like Backup & Restore, Pilot Light, Warm standby , Multi site solutions.

UNIT II Cloud BCP and Disaster recovery Lab exercises [10Hours]

Putt BCP and DR concept's in practice , Perform VM backup and restore in AWS in same region and across regions, Perform volume backup and restore in AWS in same region and across regions , Perform VM backup and restore in Google cloud in same region and across regions, Perform volume backup and restore in Google cloud in same region and across regions, Perform VM backup and restore in Azure cloud in same region and across regions, Perform volume backup and restore in Azure cloud in same region and across regions, use AWS route 53 and ELB as part of DR strategy , use AWS cloud DNS and Google load balancing as part of DR strategy , use Azure DNS and azure load balancer service as part of DR strategy

UNIT III Cloud Automation – part 1 [10Hours]

Terraform concepts, Automate aws operations with terraform, Automate Azure cloud operations with terraform, Automate Google cloud operations with terraform . Automate aws operations using Ansible , Automate azure cloud operations using Ansible , Automate Google cloud operations using Ansible .

UNIT IV Cloud Automation – part 2

[10Hours]

AWS Cloudformation concepts and Automate aws operations with cloud formation, Google cloud Deployment manager concepts and automate Google cloud operations using Deployment manager , Azure resource manager template concepts and automate azure cloud operations using Azure resource manager template. Automate aws operations using chef , Automate azure cloud operations using chef , Automate Google cloud operations using chef

Lab Experiments:

1. Perform VM backup and restore in AWS in same region and across regions,
2. Perform volume backup and restore in AWS in same region and across regions ,
3. Perform VM backup and restore in Google cloud in same region and across regions,
4. Perform volume backup and restore in Google cloud in same region and across regions,
5. Perform VM backup and restore in Azure cloud in same region and across regions,
6. Perform volume backup and restore in Azure cloud in same region and across regions,
7. Use AWS Route 53 And ELB As Part Of DR Strategy ,
8. Use AWS Cloud DNS And Google Load Balancing As Part Of DR Strategy ,
9. Use Azure DNS and azure load balancer service as part of DR strategy
10. Automate aws operations with terraform,
11. Automate Azure cloud operations with terraform,
12. Automate Google cloud operations with terraform .
13. Automate aws operations using Ansible ,
14. Automate azure cloud operations using Ansible ,
15. Automate Google cloud operations using Ansible .
16. AWS Cloudformation concepts and Automate aws operations with cloud formation,
17. Google cloud Deployment manager concepts and automate Google cloud operations using Deployment manager ,
18. Azure resource manager template concepts and automate azure cloud operations using Azure resource manager template.
19. Automate aws operations using chef ,
20. Automate azure cloud operations using chef ,
21. Automate Google cloud operations using chef .

Text Books:

1. Planning Cloud-Based Disaster Recovery for Digital Assets: The Innovative Librarian's Guide- By Robin M. Hastings
2. Disaster Recovery and Business Continuity- By Thejendra B.S.

3. Enterprise Cloud Security and Governance: Efficiently Set Data Protection and Privacy Principles- By Zeal Vora
4. Rethinking Disaster Recovery: The Impact of Cloud Computing-By Bryan Strawser

B20BS5070	BUILDING PRIVATE CLOUD WITH OPEN STACK LAB	L	T	P	C
Total Hours:26		0	0	2	2

LAB EXPERIMENTS:

1. Deploy Openstack single node private cloud on Ubuntu OS
2. Deploy Openstack single node private cloud on Centos
3. Deploy Openstack Multi node private cloud on Ubuntu OS
4. Deploy Openstack Multi node private cloud on Centos
5. Create virtual networks,
6. Create virtual routers
7. Create nova instances
8. Create volumes and attach to nova instances
9. Create images and register on cloud.

B20BS5080	MINOR PROJECT	L	T	P	C
Total Hours:40		0	0	3	3

COURSE CONTENT:

Guide Lines

- The project should be inter disciplinary
- Team size should be of max **two** members
- Use any version control software
- Project should be of Client/Server based
- Latest database servers with PL/SQL statements is must

- Proper and meaningful reports should be generated by making use of latest reporting tools
- Project report should follow standard template with the following contents:
 - a) Abstract
 - b) Introduction to project
 - c) Basic Diagrams like (DFD, ER, Class diagram, etc..)
 - d) Database and stored procedure design
 - e) Screen shots
 - f) Concussion
 - g) Future enhancement
 - h) Bibliography
- Project reports should be submitted for evaluation.

B20BS5090	SOFT SKILLS
Total Hours:30	

B20BS5100	SKILL DEVELOPMENT PROGRAM
Total Hours: 32	

B20BS5061	FUNDAMENTALS OF CLOUD COMPUTING	L	T	P	C
Total Hours: 52		4	0	0	4

COURSE DESCRIPTION:

This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Business Process as a Service (BPaaS). They will also learn how to develop Cloud-based software applications on top of various Cloud platforms, how to integrate application-level services built on heterogeneous Cloud platforms, and how to leverage SaaS and BPaaS solutions to build comprehensive end-to-end business solutions on the Cloud.

PRE-REQUISITE:

- Knowledge in virtualization concepts operating system networking and coding skills.

COURSE OBJECTIVES:

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.

- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved

COURSE OUTCOMES:

- Understand Introduction to Cloud Computing
- Understanding the roots and essential characteristics of cloud computing
- Understanding the Management and Monitoring Process of Cloud Computing.
- Understand Migration and Business model of Cloud.

COURSE CONTENT:

UNIT I Introduction to cloud computing [13Hours]

Introduction to Cloud Computing, History of cloud computing, Cloud Computing Architecture, Introduction to Mainframes, Clustering, Grid Computing, Utility computing, Edge Computing, SOA, Servers, Datacenters, 5 Characteristics of Cloud computing, Trends of cloud computing, Standards and needs for cloud computing, Network protocols and Web Services, APIs, Comparing Traditional and Cloud Data Center Costs, Virtualization and Cloud Computing, Security and Privacy in Cloud.

UNIT II CLOUD DEPLOYMENT AND SERVICE DELIVERY MODELS [13Hours]

Cloud resources, Middleware, Cloud service models: IaaS, PaaS, SaaS, XaaS, cloud computing – separation of responsibilities, Pricing, Billing, Pay as You Go, Monitoring, SLA, QoS, Cloud deployment services: Public, Private, Hybrid, Community cloud.

UNIT III Cloud Applications [13Hours]

Existing problems in cloud computing, cloud adoption barriers, Web 2.0 applications, Cloud Technologies and platforms – AWS, EC2, S3, GAE, Azure, Hadoop, Salesforce.com, Aneka, Parallel and Distributed Computing, MapReduce in cloud, Hadoop in cloud, Scaling, Elasticity, Cloud Storage, Relational Databases and NoSQL. Scientific applications, Healthcare: ECG analysis in the cloud, Biology: protein structure prediction, Geosciences: satellite image processing,

UNIT-IV Business models of cloud [13Hours]

Cloud Economics, Implementing Data security using Open Web Application Security Project, Migration to Cloud, B2C, B2B, and C2C, Big Data in Cloud, Analytics in Cloud, Understanding Future Trends of Cloud, Internet of Things (IoT), Business Innovation through Cloud Computing, Business and consumer applications, CRM and ERP, Social networking, Media applications.

Text Books:

1. Seize the Cloud - A Manager's Guide to Success with Cloud Computing by Erik van Ommeren • Sogeti USA, Martin van den Berg • Sogeti Netherlands.
2. Cloud Computing for Dummies by Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper.
3. Cloud Computing – Concepts and Practices by Naresh Sehgal & Pramod Chandra.

Reference Books:

1. “Mastering Cloud Computing” by -RajkumarBuyya, Christian Vechiolla, Thamarai S, Elsevier Publications
2. “Cloud Computing : Principles and Paradigms” by – RajkumarBuyya, James B, A Goscinski,
3. “Cloud Computing : A practical Approach” by Toby V, A velte, Robert E, 2009
5. “Cloud Application Architectures: Building Applicatios and Infrastructure in the cloud”

B20BS5062	BASICS OF DATA ANALYTICS	L	T	P	C
Total Hours: 52		4	0	0	4

COURSE DESCRIPTION:

This course is designed for students who have no previous knowledge of data analytics but wish to acquire these skills in a short period of time. These students will learn how to analyze large data sets and identify patterns that will improve any company's and organization decision-making process.

PRE-REQUISITE:

- Basic knowledge in programming language , algorithm and data structure concept strong knowledge in statistics and mathematics

COURSE OBJECTIVES:

In this course the students will learn

- The principles and methods of statistical analysis, but will also put them into practice using a range of real-world data sets.
- provide a basic understanding of data analysis using statistics and to use computational tools on problems of applied nature

COURSE OUTCOMES:

- Understand concepts, terminologies, characteristics of Big Data.
- Understand what drives Big Data in business
- Understand challenges & planning for Big Data adoption
- Understand the processing concepts of Big Data

COURSE CONTENT:

UNIT I **[13Hours]**

Understanding Big Data Concepts and terminologies, Big Data Characteristics, Different types of data.

UNIT-II **[13Hours]**

Business Motivation & Drivers of Big DataMarket place dynamics, Business Architecture, Business Process Management, ICT, IoE.

UNIT-III

[13Hours]

Big Data Adoption & Planning ConsiderationsOrganization Prerequisites, Data Procurement, Privacy, Security, Provenance, Realtime Support, Performance Challenges, Governance requirements, Methodology, Big Data Analytics Life cycle.

UNIT-IV

[13Hours]

Big Data Processing ConceptsParallel Data Processing, Distributed data Processing, Hadoop, Processing Workloads, Cluster, Processing in Batch Mode, Processing in real time mode.

Text Book:

1. Big Data Fundamental by Thomas Erl, WajidKhattak& Paul Buhler

SIXTH SEMESTER

S.NO	Code	Title	H C/ SC /F C	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	B20BS6010	DevOps	H C	3	0	1	4	5
2	B20BS6021	Deployment & Management of Private Cloud	SC	2	0	1	3	4
	B20BS6022	Entrepreneurship and management						
	B20BS6023	Machine learning and AI on cloud						
Practical Courses								
3	B20BS6030	Major Project	H C	0	0	1 0	10	20
Total Credits				5	0	1 2	17	29

B20BS6010	DEVOPS	L	T	P	C
Total Hours: 52		3	0	1	4

COURSE DESCRIPTION:

This course provides the Concepts related to Chef, its environment, Open source Chef Server and node objects are also included. Further, you will learn about Docker, its commands, use-cases and related concepts. Also, you will learn about continuous monitoring and be able to execute projects. The syllabus extends to cover the DevOps tools which are employed for development too.

PRE-REQUISITE:

- Basic knowledge on Operating System, Data Base, Middleware etc which includes Linux/Windows, Tomcat/Weblogic, Apache/Nginx etc.

COURSE OBJECTIVES:

- Understand the DevOps culture and implement DevOps complete CI/CD pipeline.

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Understand basic concept about DevOps
- Its principles and complete 360 degree picture on source control to code analysis to deployment
- Work on containerization
- Deploy and configure Jenkins

COURSE CONTENT:

UNIT I DevOps Foundation

[13Hours]

Waterfall Model concepts and challenges, Agile model concepts and benefit, DevOps Concepts and tools like Source code management tools (Github,bitbucket) , static code analysis (sonarqube, fortify) , Build tools (maven ,ant , gradle) Orchestration tools (Jenkins, bamboo CI), Build servers, Artifacts repositories (nexus, artifactory), testing tools like cucumber, selenium, Infrastructure and configuration management tools (terraform, ansible. Chef, puppet) , ELK and other important concepts in Continuous integration and continuous deployment pipeline.

UNIT II AWS DevOps

[13Hours]

AWS Devops tools introduction ,features and concepts of Amazon cloud devops tools like AWS code commit, AWS code deploy, AWS code Pipeline, AWS code build, AWS code star , AWS X-Ray, AWS beanstalk, AWS opworks concepts, AWS Elastic container service (kubernetes) . Jenkins integration with EC2 for slave nodes, Terraform with aws EC2

UNIT III Google cloud DevOps

[13Hours]

Google cloud Devops introduction ,features and concepts of Google cloud Devops tools like Google Cloud source repositories (CSR), integration of CSR with github and bitbucket, CI/CD with cloud build, Container registry, Google kubernetes engine, Google cloud deployment manager, Spinakker pipeline, Terraform with GCP kubernetes engine, Terraform with GCP cloud other services, Jenkins CICD pipeline on Google cloud, Jenkins with Google clodu compute engine and google cloud storage

UNIT IV DevOps- CI/CD

[13Hours]

Building CI?CD Pipeline of Jenkins, Github, Docker, docker hub and Kuberentes, Jenkin with sonarqube and nexus repo ,Jenkins with SonarQube .nexus and cucumber, Jenkins with sonarqube, dockerhub, terraform and kubernetes , Bamboo CI with Sonarqube ,nexus repo , docker build server,docker hub and kubernetes , Bamboo CI with fortify, nexus repo and docker build server with kubernetes, Bamboo CI with terraform and kubernetes ,Jenkins .net application Pipeline,Jenkins java spring boot application Pipeline , Jenkins python application Pipeline.

Text Book:

1. DevOps for Beginners: DevOps Software Development Method Guide for Software Developers and It Professionals : by **Joseph Joyner (Author)**

2. DevOps: From Newbie to Professional. Fast and Simple Guide to DevOps - by Dan Warnock
3. Learning Ansible by Madhurranjan Mohaan, Ramesh Raithatha , November 2014.

Reference Books:

1. Official documentation for Docker <https://www.Docker.com/>
2. Official documentation for GitHub : www.GitHub.com
3. Official documentation for Sonar qube www.sonarqube.org/
4. Official documentation for Jenkins <https://jenkins.io/>

B20BS6021	DEPLOYMENT & MANAGEMENT OF PRIVATE CLOUD	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

In this course, to connect to an Open Stack cloud, and learn how to manage cloud resources according to current industry best practices. Each topic includes lab exercises, where we have the opportunity to apply your knowledge in a realistic environment. At the end of the course students will Have a deep understanding of the fundamental ideas of cloud computing; Know how various components work and interact together; Know how to create, manage, and remove virtual resources running on an OpenStack Infrastructure-as-a-Service platform.

PRE-REQUISITE:

- Need to have knowledge about open stack private cloud and deployment.

COURSE OBJECTIVES:

The objective of this course is to:

- Deploying a OpenStack private cloud with high availability
- Install and configure a Private cloud using Microsoft System Centre Product using Microsoft Hyper-v latest server virtualization backend

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Deploying a OpenStack private cloud with high availability
- Install and configure a Private cloud using Microsoft System Centre Product using and

Microsoft Hyper-v 2012 server virtualization backend.

- Implement and manage open stack.
- Hands-on knowledge on Private Cloud

COURSE CONTENT:

UNIT I High availability components on ubuntu 18.04.

[13Hours]

HA Proxy concepts, Keepalived concepts, rabbitmq concepts, horizon dashboard concepts, configure dual HA proxy nodes with keepalived on VM1 and VM2 hosting ubuntu 18.04 server. deploy 2 node (VM3 and VM4 hosting ubuntu 18.04 server) and configure the component level clustering of rabbitmq cluster horizon , keystone concepts, keystone clustering.

UNIT II Building OpenStack High Availability on Ubuntu 18.04

[13Hours]

Install two OpenStack controller on different machines (VM 3 and VM4) , Configure OpenStack services on both controllers like Keystone, rabbitmq , nova, cinder ,glance ,horizon , test and validate the HA configure 2 KVM hosts (VM5 and vm6 hosting on ubuntu) and shared storage and integrate with OpenStack controllers and , test failover of cloud

UNIT III High availability components on Centos 7

[13Hours]

HA Proxy concepts, Keepalived concepts, rabbitmq concepts, horizon dashboard concepts, configure dual HA proxy nodes with keepalived on VM1 and VM2 hosting ubuntu 18.04 server. deploy 2 node (VM3 and VM4 hosting Centos7 server) and configure the component level clustering of rabbitmq cluster horizon , keystone concepts, keystone clustering

UNIT IV Building OpenStack High Availability on Centos7

[13Hours]

Install two OpenStack controller on different machines (VM 3 and VM4) , Configure OpenStack services on both controllers like Keystone, rabbitmq , nova, cinder ,glance ,horizon , test and validate the HA configure 2 KVM hosts (VM5 and vm6 hosting on Centos7) and shared storage and integrate with OpenStack controllers and , test failover of cloud

Text Books:

1. Open Stack Operations Guide ,Set Up and Manage Your OpenStack Cloud , By Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, Joe Topjian

2. OpenStack Cloud Computing Cookbook Second Edition by Kevin Jackson (Author), Cody Bunch (Author)
3. Microsoft System Center latest Unleashed Paperback – June 11, latest by Chris Amaris (Author), Rand Morimoto (Author), Pete Handley (Author), David Ross (Author)
4. Introducing Microsoft System Center latest R2 Technical Overview by Mitch Tulloch with Symon Perriman and the System Center Team(http://download.microsoft.com/download/C/8/A/C8A5F520-F31E-4BB4-B972-8D2525D17C38/Microsoft_Press_ebook_Introducing_System_Center_latest_PDF.pdf)
5. Pro Linux High Availability Clustering By Sander van Vugt.
6. Learning OpenStack Networking (Neutron) by James Denton
7. Building OpenStack Highly Available Infrastructure by Anil Bidari (to Be launched soon).

Reference Website:

1. Web docs : <https://www.microsoft.com/en-us/cloud-platform/system-center>

B20BS6022	ENTREPRENEURSHIP AND MANAGEMENT	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This course provides business and non-business majors with the skills necessary to succeed as an entrepreneur. The fundamentals of starting and operating a business, developing a business plan, obtaining financing, marketing a product or service and developing an effective accounting system will be covered.

PRE-REQUISITE:

- Basic knowledge in good communication skills and multi-tasking skills and strategies.

COURSE OBJECTIVES:

- Learn the Basics of management

- Understand the entrepreneurial decision making process from business model design to the launch of the new venture.
- Develop a wide range of strategic, financial and human resource planning skills necessary to the new venture planning process
- Provide an atmosphere in which course participants can apply entrepreneurial and teamwork skills in finding, evaluating and beginning the process of implementing new venture concepts
- Sharpen the presentation skills necessary to effectively communicate new venture ideas to potential investors.

COURSE OUTCOMES:

- Describe the basic principles and concepts of management and distinguish different plans and list steps in planning.
- Discuss the concepts of organizing and staffing and Interpret the concepts of directing and controlling.
- Demonstrate the meaning, functions, types and roles of an entrepreneur and describe various institutional support.
- Explain in detail about the small scale industries and prepare project report.

COURSE CONTENT:

UNIT I Management

[13Hours]

Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of Management – Management as a Science, Art or Profession Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – Early Management Approaches –Modern Management Approaches.

Planning: Nature, importance and purpose of planning, process objectives – Types of plans(Meaning only) – Decision making – Importance of planning – steps in planning & planning premises– Hierarchy of plans.

UNIT II Organizing And Staffing

[13Hours]

Nature and purpose of organization - Principles of organization –Types of organization - Departmentation – Committees – Centralization Vs decentralization of authority and responsibility – Span of control – MBO and MBE (Meaning only) Nature and importance of Staffing – Process of Selection & Recruitment (in brief).

Directing & Controlling: Meaning and nature of directing-Leadership styles, Motivation Theories, Communication – Meaning and importance – Coordination, meaning and importance and Techniques of Co- ordination. Meaning and steps in controlling – Essentials of a sound control system–Methods of establishing control.

UNIT III Entrepreneur

[13Hours]

Meaning of Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur – an emerging Class. Concept of Entrepreneurship– Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development ; Entrepreneurship in India; Entrepreneurship – its Barriers.

Small Scale Industry: Definition; Characteristics; Need and rationale: Objectives; Scope;role of SSI in Economic Development. Advantages of SSI, Steps to start an SSI – Government policy towards SSI; Different Policies of S.S.I; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.S.I, Effect of WTO/GATT Supporting Agencies of Government for S.S.I, Meaning ; Nature of Support ; Objectives ; Functions ; Types of Help ;Ancillary Industry and Tiny Industry (Definition only).

UNIT IV Institutional Support

[13Hours]

Different Schemes: TECKSOK, KIADB, KSSIDC, KSIMC, DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC.

Preparation Of Project: Meaning of project, project Identification, Project Selection, Project Report, Need and Significance of Report, Contents, formulation, Guidelines by Planning Commission for Project report, network Analysis, Errors of Project Report, Project Appraisal. Identification of Business OpportUNITies – Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

Text Books:

1. Principles of Management– P.C Tripathi, P.N.Reddy, Tata McGraw Hill, 4thEdition, 2010.

2. Dynamics of Entrepreneurial Development & Management – Vasant Desai, Himalaya Publishing House, 2011
3. Entrepreneurship Development-Small Business Enterprises– Poornima M. Charantimath, Pearson Education, 2006 (2 & 4)

Reference Books:

1. Management Fundamentals– Concepts, Application, Skill Development -Robert Lusier, 5th edition, Thomson Publications, 2011.
2. Entrepreneurship Development– S. S. Khanka, S Chand & Co., 2007.
3. Management – Stephen Robbins, Pearson Education / PHI – 17th Edition, 2003.

B20BS6023	MACHINE LEARNING AND AI ON CLOUD	L	T	P	C
Total Hours: 52		2	0	1	3

COURSE DESCRIPTION:

This Course demonstrates practical applications of AWS machine learning and Artificial Intelligence services using a blend of instructional learning and hands-on labs. Provides knowledge on how to implement and experiment with Amazon Machine Learning platform and application services.

PRE-REQUISITE:

- The skills required to learn Artificial Intelligence are Strong knowledge of Mathematics, Good command over programming languages, Good Analytical Skills, Ability to understand complex algorithms Basic knowledge of Statistics, and modeling.

COURSE OBJECTIVES:

The objective of this course is to:

- Learn machine learning and artificial intelligence with application and tools of Cloud

COURSE OUTCOMES:

A student who successfully completes the course will have the ability to:

- Deploy live chatbot using Google cloud solutions
- Perform image, video, text, speech labs using GCP
- Perform image, video, text, speech labs using Amazon cloud ML solutions
- Perform Azure ML studio labs and forecasting technique using Azure ML and AI solutions

COURSE CONTENT:

UNIT I Machine Learning and AI on GCP

[13Hours]

Vision AI : Overview and Concepts, Analyze images in the cloud or at the edge, Video AI: Overview and Features, Precise video analysis — down to the frame ,AI Platform Notebooks: Overview and Features ,An enterprise notebook service to launch projects in minutes ,AI Platform Deep Learning VM Image :Overview and Features, Preconfigured virtual machines for deep learning applications, Kubeflow: Overview and Features, The machine learning toolkit for Kubernetes ,Cloud TPU : Overview and Features Hardware designed for performance ,Natural Language : Overview and Features Multimedia and multi-language processing ,Translation : Overview and Features : Fast, dynamic translation tailored to your content

UNIT II Machine Learning and AI on GCP

[13Hours]

Cloud Speech-to-Text API : Overview and Features: Speech recognition across 120 languages, Cloud Text-to-Speech API : Overview and Features : Lifelike text-to-speech interactions, Dialog flow : Overview and Features : Conversational experiences across devices and platform , AutoML Tables : Overview and Features: Build state-of-the-art ML models on structured data, Cloud Inference API : Overview and Features : Run large-scale correlations over typed time-series datasets, Recommendations AI (beta) : Overview and Features: Deliver highly personalized product recommendations at scale, BigQuery ML : Overview and Feature : Build models with SQL, Cloud AutoML : Overview and Features: Train custom ML models quickly and easily

UNIT III Machine Learning and AI on AWS

[13Hours]

Overview and features of AWS Sagemaker, AWS Textract, AWS Translate , AWS Transcribe, AWS Recognition, Amazon Comprehend – NLP, AWS Polly ,AWS Personalize, Amazon DeepLens, Amazon Forecast (reinforcement learning) ,Amazon Lex

UNIT IV Machine Learning and AI on Azure

[13Hours]

Azure machine learning overview, Introduction to Azure machine learning studio, Developing and hosting Azure machine learning applications. **Building Azure machine learning models with ML Studio** (Prepare Azure SQL database, Import data, Visualize data, Train and evaluate a regression model and a classification model using exercise and calories data set) . **Publish Predictive models as Azure Machine Learning services** (Significance of web service, How to publish and test a web service in ML

Studio). **Building Azure Machine Learning Models with Azure ML Services (Introduction to Azure Machine Learning Services, How to build Azure machine learning models with ML services.)**

Lab Experiments:

1. Lab1 : Implementing an AI Chatbot with Google Dialog flow
2. Lab 2 : Detect Labels, Faces, and Landmarks in Images with the Cloud Vision API
3. Lab 3: Google Cloud – Deploy Jupyter notebook instance with GPU and run sample pandas or classification example program
4. Lab 4 : User vision API to identify text from image sign board (OCR) which is in chinese language and translate the text to english using Google Translate api .

5. Lab 5 : Hands on Lab :Building Azure machine learning models with ML services introduction Electricity demand forecast
6. Lab 6: Hands on Lab, Publish and test a web service using ML Studio using exercise and calories dataset ,Publishing and consuming a parameterized web service)
7. Lab 7: Hands-on lab sessions Lab, Using Exercise and Calories dataset, Explore Azure Machine Learning Studio, Upload datasets, Create Experiments, How to import data from big data sources and define a data workflow in an experiment.
8. AWS ML and AI labs
 - Labs : Deploy one click Jupyter notebooks(NB)
 - Labs : run sample Pandas programs on cloud jupyter NB
 - Labs : Extract text from documents
 - Labs – translate content from English to Chinese language
 - Labs – convert speech to text
 - Labs – Object and scene detection
 - Labs – Image Moderation
 - Labs – Facial Analysis
 - Labs – Celebrity recognition
 - Labs – Face comparison
 - Labs – Text in Image

- Labs – Video Analytics
- Labs – Analyse unstructured text
- Labs – Text to Life like speech conversion

B20BS6030	MAJOR PROJECT	L	T	P	C
Total Hours: 130		0	0	10	10

COURSE CONTENT:

Guidelines for Project Formulation

Type of Project:

As majority of the students are expected to work out a real life project in some industry/research and development laboratories/educational institutions/software companies, it is suggested that the project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution. Students are encouraged to work in the areas listed at the end. However, it is not mandatory for a student to work on a real life project. The student can formulate a project problem with the help of Guide.

Project Proposal (Synopsis)

The project proposal should be prepared in consultation with your guide. The project proposal should clearly state the project objectives and the environment of the proposed project to be undertaken. The project work should compulsorily include the software development. The project proposal should contain complete details in the following form:

1. Title of the Project
2. Introduction and Objectives of the Project
3. Project Category (RDBMS/OOPS/Networking/Multimedia/Artificial Intelligence/Expert Systems etc.)

4. Analysis (DFDs at least up to second level , ER Diagrams/ Class Diagrams/ Database Design etc. as per the project requirements).
5. A complete structure which includes: Number of modules and their description to provide an estimation of the student's effort on the project. Data Structures as per the project requirements for all the modules. Process Logic of each module. Testing process to be used. Reports generation (Mention tentative content of report)
6. Tools / Platform, Hardware and Software Requirement specifications
7. Are you doing this project for any Industry/Client? Mention Yes/No. If Yes, Mention the Name and Address of the Industry or Client
8. Future scope and further enhancement of the project.

Items To Be Included In The Project Report

The following items should be included in the Project Report:

The project report must contain the following:

1. Introduction Objectives
2. Tools/Environment Used
3. Analysis Document (This should include SRS in proper structure based on Software Engineering concepts, E-R diagrams/Class diagrams/any related diagrams (if the former are not applicable), Data flow diagrams/other similar diagrams (if the former is not applicable), Data dictionary).
4. Design Document (Modularization details, Data integrity & constraints including database design, Procedural design, User interface design) Program code (Complete code (well indented)/Detailed specification instead of code*, Comments & Description. The program code should always be developed in such a way that it includes complete error handling, passing of parameters as required, placement of procedure/function statements as needed.)
5. Testing (Test case designs are to be included separately for Unit testing, Integration testing, System testing; Reports of the outcome of Unit testing, Integration testing, System testing are to be included separately. Also, details of debugging and code improvement are to be included.)
6. Input and Output Screens
7. Limitations of the Project
8. Future Application of the Project
9. Bibliography

CAREER DEVELOPMENT AND PLACEMENT

Having a degree will open doors to the world of opportunities for you. But Employers are looking for much more than just a degree. They want graduates who stand out from the crowd and exhibit real life skills that can be applied to their organizations. Examples of such popular skills employers look for include:

1. Willingness to learn
2. Self-motivation
3. Team work
4. Communication skills and application of these skills to real scenarios
5. Requirement of gathering, design and analysis, development and testing skills
6. Analytical and Technical skills
7. Computer skills
8. Internet searching skills
9. Information consolidation and presentation skills
10. Role play
11. Group discussion, and so on

REVA University therefore, has given utmost importance to develop these skills through variety of training programs and such other activities that induce the said skills among all students. A full-fledged Career Counseling and Placement division, namely Career Development Center (CDC) headed by well experienced senior Professor and Dean and supported by dynamic trainers, counselors and placement officers and other efficient supportive team does handle all aspects of Internships and placements for the students of REVA University. The prime objective of the CDC is to liaison between REVA graduating students and industries by providing a common platform where the prospective employer companies can

identify suitable candidates for placement in their respective organization. The CDC organizes pre-placement training by professionals and also arranges expert talks to our students. It facilitates students to career guidance and improves their employability. In addition, CDC forms teams to perform mock interviews. It makes you to enjoy working with such teams and learn many things apart from working together in a team. It also makes you to participate in various student clubs which helps in developing team culture, variety of job skills and overall personality.

The need of the hour in the field of Computer Science is not only knowledge in the subject, but also the skill to do the job proficiently, team spirit and a flavour of innovation. This kept in focus, the CDC has designed the training process, which will commence from second semester along with the curriculum. Special coaching in personality development, career building, English proficiency, reasoning, puzzles,

and communication skills to every student of REVA University is given with utmost care. The process involves continuous training and monitoring the students to develop their soft skills including interpersonal skills that will fetch them a job of repute in the area of his / her interest and March forward to make better career. The School of Computer Science and Applications also has emphasised subject based skill training through lab practice, internship, project work, industry interaction and many such skilling techniques. The students during their day to day studies are made to practice these skill techniques as these are inbuilt in the course curriculum. Concerned teachers also continuously guide and monitor the progress of students.

The University has also established University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director to facilitate skill related training to REVA students and other unemployed students around REVA campus. The center conducts variety of skill development programs to students to suite to their career opportunities. Through this skill development centre the students shall compulsorily complete at least two skill / certification based programs before the completion of their degree. The University has collaborations with Industries, Corporate training organizations, research institutions and Government agencies like NSDC (National Skill Development Corporation) to conduct certification programs. REVA University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana.

The University has also signed MOU's with Multi-National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.

Programme Regulations

Summary of REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Three Years Graduate Degree Programs

1. Teaching and Learning Process:

The teaching & learning process under CBCS – CAGP of education in each course of study will have three components, namely:

(i) L= Lecture (ii) T= Tutorial (iii) P=Practice; where:

L stands for **Lecture** session consisting of classroom instruction.

T stands for **Tutorial** session consisting participatory discussion / self study/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies that equip students to acquire the much required skill component.

2. Courses of Study and Credits

- a. The study of various subjects in BCA degree program is grouped under various courses. Each of these courses carries credits which are based on the number of hours of teaching and learning.
- b. In terms of credits, every **one hour session of L amounts to 1 credit per Semester** and a minimum of **two hour session of T or P amounts to 1 credit per Semester or a three hour session of T / P amounts to 2 credits** over a period of one Semester of 16 weeks for teaching-learning process.
- c. **The total duration of a semester is 20 weeks inclusive of semester-end examination.**
- d. **A course shall have either or all the four components.** That means a course may have only lecture component, or only practical component or combination of any two or all the three components.
- e. The total credits earned by a student at the end of the semester upon successfully completing the course are L + T + P. **The credit pattern of the course is indicated as L: T: P**

Different **Courses of Study** are labeled and defined as follows:

a. Core Course:

A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course. The CORE courses of Study are of THREE types, viz – (i) Foundation Course, (ii) Hard Core Course, and (iii) Soft Core Course.

b. Foundation Course (FC):

The foundation Course is a core course which should be completed successfully as a part of graduate degree program irrespective of the branch of study. These would include basic courses in Languages, courses of study prescribed by the University.

c. Hard Core Course (HC):

The **Hard Core Course** is a Core Course in the main branch of study and related branch(es) of study, if any that the candidates have to complete compulsorily.

d. Soft Core Course (SC):

A Core course may be a **Soft Core** if there is a choice or an option for the candidate to choose a course from a pool of courses from the main branch of study or from a sister/related

branch of study which supports the main branch of study.

e. Open Elective Course:

An elective course chosen generally from other discipline / subject, with an intention to seek exposure to the basics of subjects other than the main discipline the student is studying is called an **Open Elective Course**.

f. Project Work / Dissertation:

Project work / Dissertation work is a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A project work carrying **FOUR or SIX** credits is called **Minor Project work / Dissertation**. A project work of **EIGHT, TEN, TWELVE or SIXTEEN** credits is called **Major Project work / Dissertation**. **A Minor Project work may be a hard core or a Soft Core as decided by the BOS / concerned. But the Major Project shall be Hard Core.**

3. Scheme, Duration and Medium of Instructions:

3.1. The BCA Degree program is of 6 semesters - 3 years duration. A candidate can avail a maximum of 12 semesters - 6 years as per double duration norm, in one stretch to complete the BCA, including blank semesters, if any. Whenever a candidate opts for blank semester, he/she has to study the prevailing courses offered by the School when he/she resumes his/her studies.

3.2. The medium of instruction shall be English.

4. Credits and Credit Distribution

4.1. A candidate has to earn 120 credits for successful completion of Three Year BCA degree with the distribution of credits for different courses as decided by the Board of Studies.

4.2. The concerned BOS based on the credits distribution pattern given above shall prescribe the credits to various types of courses and shall assign title to every course including project work, practical work, field work, self study elective, as **Foundation Course(FC), Hard Core(HC) or Soft Core(SC) or Open Elective(OE)**.

4.3. A candidate can enroll for a maximum of 30 credits and a minimum of 20 credits per Semester. However he / she may not successfully earn a maximum of 30 credits per semester.

This maximum of 30 credits does not include the credits of courses carried forward by a candidate.

4.4. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VI semester and complete successfully 120 credits in 6 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities.

5. Add- on Proficiency Certification:

To acquire **Add on Proficiency Certification** a candidate can opt to complete a minimum of 4 extra credits either in the same discipline /subject or in different discipline / subject in excess to 120 credits for the Three Year BCA Degree program.

6. Add on Proficiency Diploma:

6.1.To acquire **Add on Proficiency Diploma**, a candidate can opt to complete a minimum of 18 extra credits either in the same discipline /subject or in different discipline / subject in excess to 120 credits for the Three Year BCA Degree program.

6.2. The **Add on Proficiency Certification / Diploma** so issued to the candidate contains the courses studied and grades earned.

7. Scheme of Assessment & Evaluation

7.1. The Scheme of Assessment and Evaluation will have two parts, namely;

- i. Internal Assessment (IA); and
- ii. Semester End Examination

7.2. Assessment and Evaluation of each Course shall be for 100 marks. The Internal Assessment and Semester End Examination of UG non engineering programs and PG programs shall carry 50 marks each (i.e., 50 marks internal assessment; 50 marks semester end examination).

7.3. The 50 marks of Internal Assessment shall comprise of:

Internal Test	=	30 marks
Assignments	=	10 marks
Presentations / Quizzes / Case studies	=	10 marks

7.4. There shall be two internal tests conducted as per the schedule given below. The students have

to attend all the two tests compulsorily.

- 1st test for 15 marks at the end of 8th week of the beginning of the Semester; and
- 2nd test for 15 marks at the end of the 16th week of the beginning of the Semester; and

7.5. The coverage of syllabus for the said three tests shall be as under:

- For the 1st test syllabus shall be 1st and 2nd unit of the course;
- For the 2nd test it shall be 3rd and 4th unit;

7.6. The Semester End Examination for 50 marks shall be held during 18th and 19th week of the beginning of the semester and **the syllabus for the semester end examination shall be entire 4 units.**

7.7. **The duration of the internal test shall be 75 minutes and for semester end examination the duration shall be 3 hours.**

Summary of Continuous Assessment and Evaluation Schedule

Type of Assessment	Period	Syllabus	Marks	Activity
First Test	8 th Week	1 st and 2 nd Units	15	Consolidation of 1 st and 2 nd Unit
Allocation of Topics for Assignments	-	First Unit and second unit		Instructional process and Continuous Assessment
Submission of Assignments	-	First Unit and second unit	5	Instructional process and Continuous Assessment
Presentations / Quizzes/Case studies	-	First Unit and second unit	5	Instructional process and Continuous Assessment
Second Test	16 th Week	Third unit and Fourth unit	15	Consolidation of 3 rd and 4 th Unit
Allocation of Topic for 2nd Assignment	-	2 nd half of second unit and 3 rd Unit		Instructional process and Continuous Assessment
Submission of Assignments	-	2 nd half of second unit and 3 rd Unit	5	Instructional process and Continuous Assessment
Presentations /	-	2 nd half of	5	Instructional

Quizzes / Case studies		second unit and 3 rd Unit		process and Continuous Assessment
Semester End Practical Examination	17 th Week	Entire syllabus	50	Conduct of Semester - end Practical Exams
Preparation for Semester–End Exam	16 th & 17 th Week	Entire Syllabus		Revision and preparation for semester–end exam
Semester End Theory Examination	18 th Week & 19 th Week	Entire Syllabus	50	Evaluation and Tabulation
	End of 20 th Week			Notification of Final Grades

Note: 1. Examination and Evaluation shall take place concurrently and Final Grades shall be announced latest by 5 days after completion of the examination.

1. Practical examination wherever applicable shall be conducted after 2nd test and before semester end examination. The calendar of practical examination shall be decided by the respective School Boards and communicated well in advance to the Registrar (Evaluation) who will notify the same immediately

8.0. Evaluation of Practical's and Minor Project / Major Project / Dissertation

8.1. The performance in the practice tasks / experiments shall be assessed on the basis of:

- a) Knowledge of relevant processes;
- b) Skills and operations involved;
- c) Results / products including calculation and reporting.

8.2 The 50 marks meant for continuous assessment of the performance in carrying out practical's shall further be allocated as under:

i	Conduction of regular practical / experiments throughout the semester	20 marks
ii	Maintenance of lab records	10 marks
iii	Performance of mid-term test (to be conducted while conducting second test for theory courses); the performance assessments of the mid-term test includes performance in the conduction of experiment and write up about the experiment.	20 marks
	Total	50 marks

The 50 marks meant for Semester End Examination, shall be allocated as under:

i	Conduction of semester end practical examination	30 marks
ii	Write up about the experiment / practical conducted	10 marks
iii	Viva Voce	10 marks
	Total	50 marks

8.3. The duration for semester-end practical examination shall be decided by the concerned School Board.

8.4 Evaluation of Minor Project / Major Project / Dissertation:

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the supervisor. At the end of the semester, the candidate has to submit final report of the project / dissertation, as the case may be, for final evaluation. The components of evaluation are as follows:

i	Periodic Progress and Progress Reports (25%)
ii	Results of Work and Draft Report (25%)
iii	Final Evaluation and Viva-Voce (50%). Evaluation of the report is for 30% and the Viva-Voce examination is for 20%.

9.1 Provision to Carry Forward the Failed Subjects / Courses:

A student who has failed in a given number of courses in odd and even semesters shall move to next semester of immediate succeeding year and final year of the study. However, he / she shall have to clear all the courses of all semesters within the double duration, i. e., within six years of admission of the first semester failing which the student has to re-register to the entire program.

9.2 Re-Registration and Re-Admission:

a) In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University, such a candidate is considered as dropped the semester and is not allowed to appear for end semester examination and he / she shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

b) In such a case where in a candidate drops all the courses in a semester due to personal

reasons, it is considered that the candidate has dropped the semester and he / she shall seek re-admission to such dropped semester.

10. Attendance Requirement:

10.1 All students must attend every lecture, tutorial and practical classes.

10.2 In case a student is on approved leave of absence (e g:- representing the university in sports, games or athletics, placement activities, NCC, NSS activities and such others) and / or any other such contingencies like medical emergencies, the attendance requirement shall be minimum of 75% of the classes taught.

10.3 Any student with less than 75% of attendance in aggregate of all the courses including practical courses / field visits etc, during a semester shall not be permitted to appear to the end semester examination and such student shall seek re-admission as provided above.

10.4 Teachers offering the courses will place the above details in the School Board meeting during the last week of the semester, before the commencement of examination, and subsequently a notification pertaining to the above will be brought out by the Director of the School before the commencement of examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

11. Challenge Valuation

a. A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 10 days after the announcement of the results. This challenge valuation is only for SEE.

b. The answer scripts for which challenge valuation is sought for shall be evaluated by the external examiner who has not involved in the first evaluation. The higher of two marks from first valuation and challenge valuation shall be the final.

12. Grade Card and Grade Point:

a. **Provisional Grade Card:** The tentative / provisional Grade Card will be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. The

provisional grade card provides **Semester Grade Point Average (SGPA)**.

- b. Final Grade Card:** Upon successful completion of MCA Degree a Final Grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Registrar (Evaluation).
- c. The Grade and the Grade Point:** The Grade and the Grade Point earned by the candidate in the subject will be as given below:

Marks P	Grade G	Grade Point (GP=V x G)	Letter Grade
90>100	10	v*10	O
80>90	9	v*9	A+
70 > 80	8	v*8	A
60> 70	7	v*7	B+
55 > 60	6	v*6	B
50 > 55	5.5	V*5.5	C
40> 50	5	v*5	P
0-40	0	v*0	F
ABSENT			AB

O - Outstanding; A-Excellent; B-Very Good; C-Good; D-Fair; E-Satisfactory; F - Fail

Here, P is the percentage of marks ($P=[(IA)+M]$) secured by a candidate in a course which is **rounded to nearest integer**. V is the credit value of the course. G is the grade and GP is the grade point.

i. Computation of SGPA and CGPA

The following procedure to compute the Semester Grade Point Average (SGPA)

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student in a given semester, i.e :

$$SGPA (S_i) = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

ii. Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (144) for MCA degree is calculated taking into account all the courses undergone by a student over all the semesters of a program i. e.,

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

CONVERSION OF GRADES INTO PERCENTAGE:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

Illustration: CGPA Earned 8.11 x 10 = 81.1

12.1 Classification of Results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

CGPA	Grade (Numerical Index)	Letter Grade	Performance	FGP
	G			Qualitative Index
9 >= CGPA 10	10	O	Outstanding	Distinction
8 >= CGPA < 9	9	A+	Excellent	
7 >= CGPA < 8	8	A	Very Good	First Class
6 >= CGPA < 7	7	B+	Good	
5.5 >= CGPA < 6	6	B	Above average	Second Class

> 5 CGPA < 5.5	5.5	C	Average	
> 4 CGPA < 5	5	P	Pass	Satisfactory
CGPA < 4	-	F	Fail	-

Overall percentage=10*CGPA

12.2 Provision for Appeal

If a candidate is not satisfied with the evaluation, he/she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

For every program there will be one grievance cell. The composition of the grievance cell is as follows:-

- The Registrar (Evaluation) - Ex-officio Chairman / Convener
- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.
- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

12.3 With regard to any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellor shall be final.

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