MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CURRICULUM

AND

SCHEME OF EXAMINATION

(B.TECH IN COMPUTER SCIENCE & ENGINEERING, Data Science)

BATCH: 2023-27

FOREWORD

This is to certify that this booklet contains the entire Curriculum and Scheme of Examination of B.Tech(Computer Science and Engineering, Hons in Artificial Intelligence & Machine learning) being offered at the School of Engineering and Technology(SET) of this University. This has been duly vetted and finally approved by the Academic Council of the University vide its 43 meeting held on 5th August 2023 and changes, if any deemed appropriate, shall be duly incorporated after the necessary approval by the Academic Council.

This Curriculum and Scheme of Examination of B.Tech (Computer Science and Engineering, Hons in Data Science shall be implemented w.e.f. AY 2023-24.

Prof. (Dr.) Brijesh Kumar
Dean-Academics, MRIIRS

Date:

Preamble:

The Department of Computer Science & Engineering (CSE) focuses on mastering the fundamental concepts both theoretically and practically. The curriculum for the course is geared towards regional, national, and global needs. Keeping in view the growth in industry and increasing demand for computer professionals, some industry associated courses like Mobile Application Programming Using Android, Python, Web development, R programming, Grid Computing, Cloud computing, WEKA, Go Language, SWIFT, Kotline, Blockchain Technology, Internet of Things, and Machine Learning are also included. The courses like professional communication, Quantitative Aptitude and Personality Development, Industrial projects, and Internships facilitate students to cope up with the industrial environment. The course has been designed specifically to address the rising global outlook and focuses on upcoming technologies in the field of Computer Science and Engineering. This aims to cater to the needs of the industry and R&D organizations. Students also practice research by studying Research & Innovation Catalyst (RIC) in different semesters. The curriculum includes Environmental Studies, Constitution of India, Cyberlaw & Ethics. Students get the opportunity to learn various foreign languages French, German, Spanish for their global needs. Also, there is a provision to opt for various MOOC courses.

Curriculum also illustrates the categorization of Regional, National, and Global courses. Courses like Chemistry, Physics, Mathematics, etc. are under the Regional category, courses like Programming for Problem Solving, EVS, etc. are under the National category and the courses like Professional Communication, Machine Learning, etc. fall under the category of Global.

For providing the latest technology updates to the students, regular interactions are in practice with Information Technology organizations like TCS, IBM, Sun Microsystems, L&T, Infosys, HCL, Tech Mahindra, Dell-EMC, R Systems International, etc. The Department has collaborated with IBM to jointly deliver B.Tech (Computer Science & Engineering) programmes with a specialization in Cloud Computing, Business Analytics & Optimization, Cyber Security & Forensics, and Graphics & Gaming. Approximately 25 percent of the credits shall relate to the specific specialization in a particular programme.

The curriculum enumerates Employability, Skill Development, and Entrepreneurship. Courses like Object-Oriented Programming, Database Management Systems, etc. focus on Employability. Courses like Artificial Intelligence, Machine Learning, etc. emphasize Skill Development. Courses like Summer Internship-II, Project, etc. focus on Entrepreneurship. The program provides the distinct categorization on Environment and Sustainability, Professional Ethics and Human Values like EVS, Professional Communication, Cyberlaw & Ethics, etc.

INDEX

VISION OF THE DEPARTMENT

To empower the graduates to be technologically adept, innovative, self-motivated and responsible citizens, possessing human values and contribute significantly towards being a center of excellence in providing globally standard education, through a conducive Teaching and Research environment, that responds swiftly to the challenges of the ever changing world.

MISSION OF THE DEPARTMENT

- To achieve academic excellence by imparting in-depth knowledge to the students through effective pedagogies and hands-on experience on the latest tools and technologies.
- To pursue interdisciplinary research that will serve the needs of the entire global community.
- To prepare students to be continuous learners in a connected world and imbibe professional skills and ethical responsibilities in them.
- To strengthen the Industry-Academia interface that will help the graduates to emerge as leaders in academics or an inspiring revolutionary in entrepreneurship.

ABOUT THE DEPARTMENT

The Department of Computer Science & Engineering was established in 1997. The B. Tech Computer Science & Engineering programme offered by the Department had been accredited thrice by the National Board of Accreditation (NBA) in 2003, 2007, and 2018. The Department focuses on mastering the fundamental concepts both theoretically and practically. It motivates for learning, intellectual efficacy, and self-reliance, which provides the best foundation for continuing professional achievement. Master of Technology in Computer Engineering programme provides intensive training to the students at an advanced level to enable them to take up research and development activities. The course curriculum has been specially tailored to fulfill the growing global outlook and focus on upcoming technologies in the field of Computer Science and Engineering to cater to the needs of the industry and R&D organizations. The Faculty members of the Department are actively involved in research and development activities and continuously participating and contributing to National and International Conferences and Seminars. The faculty members of the Department are well published, experienced, conferred with M. Tech/Ph. D degree.

The Department is having several student chapters of the professional bodies like IEEE, CSI, ACM & ISTE. Students are participating in various activities regularly to enhance their technical and interpersonal skills under the banner of these professional societies. The Department also interacts regularly with Information Technology organizations like TCS, IBM, Sun Microsystems, L&T, Infosys, HCL, Tech Mahindra, Dell-EMC, R Systems International, etc. for providing the latest technology updates to the students.

MRIIRS has collaborated with IBM to jointly offer B.Tech-Computer Science & Engineering programmes with a specialization in Cloud Computing, Business Analytics & Optimization, Cyber Security & Forensics, and Graphics & Gaming. The subject matter experts from IBM technology teach the faculty members about the cutting edge technologies through 'Train the Trainer' programmes. IBM provides Learning Management System, Industry Projects for students, Expert Lectures, Industry connectivity for students & teachers to enable them to experience the live IT environment. This partnership help students to acquire domain skills in the most advanced areas of IT and preferential placements by IT companies. Students enrolled in these programmes have access to an online Eco-system Platform namely Innovation Center for Open Standards enabling them to access course material, discussion forums, student projects, industry mentors, and news-clips.

Students enrolled in these programs undertake live projects developed by IBM/other IT majors under the mentorship of industry experts and go for industry visits in software development and testing centers. They also attend a one-week extensive training programme at Bangalore in IBM facilities at their cost in which hands-on training is provided by IBM and other IT company experts. IBM shall also issue certificates for various modules after successful completion in addition to the MRIIRS Degree. The Programmes in association with IBM lead to a big increase in job opportunities and industry readiness for the students.

Approximately 25% of the credits shall relate to the specific specialization in a particular programme and replace certain courses covered under normal B. Tech CSE Programmes.

The Department has also collaborated with other leading industries to give exposure to the students. TCG Digital solutions private Limited will set up a virtual Cyber Security platform lab for training the students in the area of cybersecurity. The Department also has collaborations with Infosys, Dell-EMC & R-Systems International Ltd. These collaborations help the students to work on the technologies which are currently being used in the industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Department of Computer Science and Engineering (CSE), in consultation with various stakeholders, has formulated the Programme Educational Objectives (PEOs). These are broad statements describing the career and professional accomplishments of the graduates, that the programme is preparing them to achieve, after receiving the degree. The PEOs of the B. Tech Programme in Computer Science and Engineering are as follows:

PEO-1: To prepare the graduates for a successful career in industry, consultancy, teaching and allied areas related to the subjects of Computer Science and Engineering.

PEO-2: To assimilate the graduates with team-spirit, leadership and problem-solving skills so they can lead organizations they join or initiate their own ventures.

PEO-3: To prepare and assist the graduates to be successful in higher education leading to Masters and Research programmes, thereby creating and disseminating knowledge through research activities in the theory and application of computing.

PEO-4: To groom the graduates as professional engineers with an understanding of professional and ethical responsibilities, enabling them to contribute effectively to the growth and development of a body of knowledge.

PEO-5: To instill the ability to analyze the requirements, understand the technical specifications and design the innovative solutions by applying the principles of computing.

PROGRAMME OUTCOMES (POs) - Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complexengineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems anddesign system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutionsin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)- Engineering Graduates will be able to:

1. **Legacy Software:** Upgrade and maintain legacy software systems by using modern techniques, programming skills, and tools.
2. **Development of Software Systems:** Develop, test and maintain Software systems for business and other applications, that meets the automation needs of the society and industry.
3. **Research and Development**: Cultivate the field of computing and its latest trends, to pursue teaching, research & development activities and to work effectively in a team.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES TO PROGRAM OUTCOMES

POs / PEOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
PEO 1	3	3	2	2	2	1	1	1	2	2	3	2	3	3	2
PEO 2	2	3	3	3	2	1	1	1	3	2	2	3	2	2	3
PEO 3	3	3	2	3	3	1	1	1	2	3	2	2	3	3	3
PEO 4	3	2	2	2	2	2	2	3	2	2	1	2	3	3	3
PEO 5	3	3	3	3	3	1	1	1	2	2	1	2	3	3	3

Semester system and Choice Based Credit System (CBCS)

A credit-based system of study and students' performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, the grade point average is calculated.

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for a lecture, tutorial, and laboratory/clinical practice in a week. A few courses/activities are without credit (s) and are referred to as Audit Pass Courses (APC) but are mandatory to pass as partial fulfillment of the award of a degree.

(b)Earning of Credits

At the end of every course, a letter "Grade" shall be awarded in each course for which a student has registered. On obtaining a minimum Pass Grade, the student shall accumulate the course credits as Earned Credits. A student's performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however, shall be mandatory to pass as partial fulfillment of the award of a degree.

For the Award of Degree of a Programme B.Tech in Computer Science and Engineering, he/she has to earn a minimum of 160 credits during the 4-year duration of the programme in 8-semesters. The total credits required to be earned have been further classified under two baskets of courses: "Compulsory Courses Basket (CBB)", and "Elective Courses Basket (ECB)". A total of 122.5 credits are required to be earned under CBB and 37.5 credits under ECB.

All courses under CBB are required to be qualified and cleared/pass by every student enrolled under the programme and are semester-wise listed in the study scheme along with the credits assigned to each course.

Under Elective Courses Basket (ECB), there will be three types of courses:

- Semester-wise courses offered by the department itself
- Open/Inter-disciplinary courses offered at the Institute/University level notified from the office of Dean-Academics.
- Massive Open Online Courses (MOOCs) available on Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM)Platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. The student shall be required to register courses every semester for as many courses/credits specified under the "Elective Courses Basket" depending upon his/her interest, capability/pace of learning, and availability of time slot (without any clash in time table) to earn all required total credits under the "Elective Courses Basket" during the entire programme duration.

However, for registration of courses [including courses under "Compulsory Courses Basket", "Elective Courses Basket" and Previous Semester Courses (wherein he/she was declared ineligible based on attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.

Study Scheme of B.Tech CSE-Data Science

SEMESTER-I													
(Common for All B.Tech. Programmes)													
Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Evaluation Continuous	End Semester Evaluation	Total		
Compulsory Courses													
BSC	BPH-106	Physics for Engineers	NA	NA	3+1 #	0	0	4	100	100	200	3 hrs	3
BSC	BMA-101	Mathematics-I	NA	NA	3+1 #	1	0	5	100	100	200	3 hrs	4
ESC	BEE-103	Basic Electrical and Electronics Engineering (Group A)	NA	NA	3	0	0	0	100	100	200	3 hrs	3
ESC	BCS-100 A	AI For Engineers	NA	NA	2	0	0	2	100	100	200	3 hrs	2
ESC	BME-101A	Engg Graphics & Design	NA	NA	0	0	4	4	100	100	200	3 hrs	2
BSC	BPH-151A	Physics lab	NA	NA	0	0	2	2	50	50	100	2 hrs	1
ESC	BEE-151A	Basic Electrical Engg lab	NA	NA	0	0	2	2	50	50	100	2 hrs	1
HSMC	CDC-PC-101	Professional Communication - I	NA	NA	2	0	0	2	50	50	100	2 hrs	2
HSMC	BHM-MC-001	Constitution of India*	NA	NA	0	1	0	1	50	50	100	2 hrs	AP
		Total			**15**	**3**	**8**	**26**	**700**	**700**	**1400**	**23**	**18**

9# Contact hours per week have been increased due to bridge course.

(Common for All B.Tech. Programmes) B.Tech (Non-CSE branches and CSE N): Group A
B.Tech CSE (SPL): Group B

SEMESTER-II													
Course Type	**Subject Code**	**Subject**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Evaluation Continuous**	**End Semester Evaluation**	**Total**		
Compulsory Courses													
BSC	BCH-106	Chemistry for Engineers	NA	NA	2+1 #	0	0	3	100	100	200	3 hrs	2
BSC	BMA-201	Mathematics-II	NA	NA	3	1	0	4	100	100	200	3 hrs	4
ESC	BCS-101A	Programming for Problem Solving	NA	NA	3	0	0	3	100	100	200	3 hrs	3
BSC	BBT-100A	Biology for Engineers	NA	NA	2	0	0	2	100	100	200	3 hrs	2
ESC	BME-102	Workshop/Manufacturing Practices	NA	NA	0	0	4	4	100	100	200	2 hrs	2
BSC	BCH-151A	Chemistry lab	NA	NA	0	0	2	2	50	50	100	2 hrs	1
ESC	BCS-151A	Programming for Problem Solving lab	NA	NA	0	0	2	2	50	50	100	2 hrs	1
HSMC	CDC-PC-102	Professional Communication - II	NA	NA	2	0	0	2	50	50	100	2 hrs	2
HSMC	BCH-MC-002	EVS**	NA	NA	0	1	0	1	50	50	100	2 hrs	AP
		Total			**11**	**2**	**10**	**23**	**700**	**700**	**1400**	**22**	**16**

NOTE: Contact hours per week have been increased due to bridge course.

SEMESTER- III													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Evaluation Continuous**	**End Semester Evaluation**	**Total**		
Compulsory Courses													
CORE	BCS-DS-301	Data Structures & Algorithms	NIL		3	1	0	4	100	100	200	3Hrs	4
ESC	BEC-DS-322	Digital Electronics and Circuits	NIL		3	0	0	3	100	100	200	3Hrs	3
CORE	BCS-DS-302A	Object Oriented Programming	NIL		2	1	0	3	100	100	200	3Hrs	3
HSMC	BHM-001A	Cyber Law & Ethics	NIL		2	0	0	2	100	100	200	3Hrs	2
BSC	BMA-303A	Mathematics-III	NIL		2	1	0	3	100	100	200	3Hrs	3
CORE	BCS-DS-351	Data Structures & Algorithms Lab	NIL		0	0	2	2	50	50	100	2 Hrs	1
ESC	BEC-DS-362	Digital Electronics and Circuits Lab	NIL		0	0	2	2	50	50	100	2 Hrs	1
CORE	BCS-DS-352	Object Oriented Programming Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
HSMC	DTI-300	Design, Thinking and Innovation-I	NIL		0	1	0	1	50		50	1hrs	1
HSMC	BHM-MC-004	Quantitative Aptitude	NIL		0	0	2	2	50	50	100	2 hrs	AP
HSMC	BHM-MC-002	Sports and Yoga	NIL		2	0	0	2	100	-	100	1hrs	AP
PROJ	PROJ-CS-300A**	Summer Internship – I	NIL		2 weeks Minimum				50	-	50	2 hrs	1
CORE	BCS-DS-313	Mathematics for Data Science	NIL	I	3	0	0	3	100	100	200	3Hrs	3
TOTAL (CF)					17	3	10	**29**	1050	800	1800	32	**23**
Elective Courses *													
* Under Elective Courses, Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per prescribed limit for maximum credits (28) in a semester and for the category of Elective Courses under University Rules.													
**Training undertaken by students during the Summer vacation after second Semester (2 weeks minimum) will be evaluated as a III Semester subject.													

SEMESTER- IV													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Evaluation Continuous**	**End Semester Evaluation**	**Total**		
Compulsory Courses													
CORE	BCS-DS-401	Discrete Mathematics	NIL		3	1	0	4	100	100	200	3Hrs	4
CORE	BCS-DS-402	Computer Organization & Architecture	NIL		3	0	0	3	100	100	200	3Hrs	3
CORE	BCS-DS-427A	Python	Object Oriented Programming	BEC-DS-322	2	0	0	2	100	100	200	3Hrs	2
CORE	BCS-DS-479A	Python Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
CORE	BCS-DS-403	Operating Systems	NIL		3	1	0	4	100	100	200	3Hrs	4
CORE	BCS-DS-404	Database Management Systems	NIL		3	1	0	4	100	100	200	3Hrs	4
CORE	BCS-DS-405	Computer Networks	NIL		3	0	0	3	100	100	200	3Hrs	3
CORE	BCS-DS-451	Operating Systems Lab	NIL		0	0	2	2	50	50	100	2Hrs	1
CORE	BCS-DS-452	Database Management Systems Lab	NIL		0	0	2	2	50	50	100	2 Hrs	1
CORE	BCS-DS-453	Computer Networks Lab	NIL		0	0	2	2	50	50	100	2 Hrs	1
HSMC	DTI-400	Design, Thinking and Innovation-II	Design, Thinking and Innovation -I	DTI-300	0	1	0	1	50	-	50	1Hrs	1
HSMC	BHM-MC-006	Quantitative Aptitude and Personality Development-I	NIL		0	0	2	2	50	50	100	2 hrs	AP
HSMC	BHM-320	Universal Human Values 2: Understanding Harmony	NIL		1	1	0	2	50	50	100	2 hrs	2
TOTAL					18	6	10	33	800	750	1550	26	27
Elective Courses *													
Domain Specific Data Science	BCS-DS-422	Open Source Software	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-423	Cloud Computing	NIL		3	0	0	3	100	100	200	3Hrs	
	BCS-DS-446	Statistical Foundations of Data Science	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-447	Matrix Computations for Data Science			2	0	0	2	100	100	200	2 hrs	3
	BCS-DS-473	Programming using R	NIL		0	0	2	2	50	50	100	2 Hrs	1
Domain Specific													
	BCS-DS-428	Blockchain Technology	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-	Blockchain	NIL		0	0	2	2	50	50	100	2 hrs	1

	DS-481	Technology Lab											
	BCS-DS-430	Software Engineering and Project Management	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-482	Mobile Application Development Lab	NIL		0	0	4	4	50	50	100	2 hrs	2
	BCS-DS-472	Web development II	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-475	Cloud Computing Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-478	XML based lab	NIL		0	0	4	4	50	50	100	2 hrs	2

* Under Elective Courses, Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per prescribed limit for maximum credits (28) in a semester and for the category of Elective Courses under University Rules.

SEMESTER- V													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Continuous Evaluation**	**End Sem Examination**	**Total**		
Compulsory Courses													
CORE	BCS-DS-508	Data handling and visualization			3	0	0	3	100	100	200	3 hrs	3
CORE	BCS-DS-557	Data handling and visualization Lab			0	0	0	2	50	50	100	2 Hrs	1
CORE	BCS-DS-502	Formal Language & Automata Theory	NIL		3	1	0	4	100	100	200	4 hrs	4
CORE	BCS-DS-503	Artificial Intelligence	NIL		3	0	0	3	100	100	200	3Hrs	3
CORE	BCS-DS-552	Artificial Intelligence Lab	NIL		0	0	2	2	50	50	100	2 Hrs	1
CORE	BCS-DS-501	Design & Analysis of Algorithms	Data Structures & Algorithms	BCS-DS-301	3	1	0	4	100	100	200	3 hrs	4
CORE	BCS-DS-551	Design & Analysis of Algorithms Lab	Data Structures & Algorithms Lab	BCS-DS-351	0	0	2	2	50	50	100	2 hrs	1
HSMC	BHM-MC-008	Quantitative Aptitude and Personality Development-II	NIL		0	0	2	2	50	50	100	2 hrs	AP
HSMC	BHM-520	Entrepreneurship and Start-ups	NIL		2	0	0	2	100	100	200	3hrs	2
HSMC	DTI-500	Design, Thinking and Innovation-III	Design, Thinking and Innovation-II	DTI-400	0	1	0	1	50	-	50	-	2
PROJ	PROJ-CS-	Summer Internship-II	NIL		4 weeks Minimum				100	-	100	2 hrs	2

	500**												
TOTAL					**14**	**4**	**8**	**26**	**850**	**700**	**1550**	**25**	**23**
Elective Courses *													
Domain Specific-SEAC (Data Science)	BCS-DS-539	Data Science with python	Python Lab	BCS-DS-479A	2	0	0	2	100	100	200	2 hrs	2
	BCS-DS-588	Data Science with python Lab	Python Lab	BCS-DS-479A	0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-538	Intelligent Information Retrieval	NIL		2	0	0	2	100	100	200	2 hrs	2
	BCS-DS-587	Intelligent Information Retrieval Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-524	Knowledge Based Systems	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-631A	Digital Image Processing	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-541	Development Automation	NIL		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCS-DS-521	Computer Graphics	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-571	Computer Graphics Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-474	Java Programming	Object Oriented Programming	BCS-DS-302A	0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-572	Dot Net	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-573	Visual Basics	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-575	Go Language	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-576	SWIFT	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-577	Kotline	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-522A	Software Development Processes	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-578A	Software Development Processes Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-523	Management Information System	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-525	System Analysis and Design	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-531	Data Warehouse	Database Management Systems	BCS-DS-404	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-507	UI/UX	NIL		0	0	4	4	100	100	200	3 hrs	2
Generic Elective I													
Generic Elective	HM 506	French I	NIL		2	0	0	2	50	50	100	1.5 Hrs	
	HM 507	German I	NIL		2	0	0	2	50	50	100	1.5 Hrs	
	HM 508	Spanish I	NIL		2	0	0	2	50	50	100	1.5 Hrs	

e														

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other offered courses as per prescribed limit for maximum credits (28) in a semester and for the category of Elective Courses under University Rules.

**Training undertaken by students during the Summer vacation after fourth Semester (4 weeks minimum) will be evaluated as a V Semester subject.

SEMESTER- VI

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	
			Title	Code	L	T	P	Total	Continuous Evaluation	End Sem Examination	Total		
Compulsory Courses													
CORE	BCS-DS-602	Machine Learning	NIL		3	1	0	4	100	100	200	3 hrs	4
HSMC	BHM-MC-009	Quantitative Aptitude and Personality Development-III	NIL		0	0	2	2	50	50	100	2 hrs	AP
PROJ	PROJ-CS-600	Project Phase I	NIL		0	0	2	2	50	-	50	-	1
CORE	BCS-DS-652	Machine Learning Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
CORE													
TOTAL					**3**	**0**	**6**	**10**	**250**	**200**	**450**	**07**	**06**
Elective Courses *													
Domain Specific	BCS-DS-621	Software Testing And Quality Assurance	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-622 A	Advance Data Base Management Systems	Database Management Systems	BCS-DS-404	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-671 A	Advance Data Base Management Systems Lab	Database Management Systems Lab	BCS-DS-452	0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-624	Complier Design	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-673	Complier Design Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-676	Web Development Framework	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-632	Data Mining	Database Management Systems	BCS-DS-404	3	0	0	3	100	100	200	3 hrs	3

	BCS-DS-682	Data Mining Lab using WEKA	NIL		0	0	2	2	50	50	100	2 hrs	1
Domain Specific-SEAC (Data Science)	BCS-DS-611	Deep Learning	Machine Learning	BCS-DS-602	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-659	Deep Learning Lab	Machine Learning Lab	BCS-DS-652	0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-610	Natural Language Processing	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-658	Natural Language Processing Lab	Python Lab	BCS-DS-479A	0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-635	IOT for AI	NIL		2	0	0	2	100	100	200	3 hrs	2
	BCS-DS-684	IOT for AI Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-646	Data Mining for Data Science	NIL		2	0	0	2	100	100	200	3 hrs	2
	BCS-DS-694	Data Mining for Data Science Lab	Nil		0	0	0	2	50	50	100	2 hrs	1
	BCS-DS-638	Deep Neural Networks	Deep Learning	BCS-DS-611	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-639	Applied Natural Language Processing	Natural Language Processing	BCS-DS-610	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-640	Sensor Technologies	NIL		3	0	0	3	100	100	200	3 hrs	2
	BCS-DS-685	Sensor Technologies Lab	NIL		0	0	2	2	50	50	100	2 Hours	1
	BCS-DS-603	Internet Of Things (IOT)	NIL		3	1	0	4	100	100	200	3 hrs	4
	BCS-DS-653	Internet Of Things (IOT) lab	NIL		0	0	2	2	50	50	100	2 hrs	1
Generic Elective II													
Generic Elective	HM 606	French II	NIL		2	0	0	2	50	50	100	1.5 Hrs	2
	HM 607	German II	NIL		2	0	0	2	50	50	100	1.5 Hrs	2
	HM 608	Spanish II	NIL		2	0	0	2	50	50	100	1.5 Hrs	2

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits (28) and for the category of Elective Courses under University Rules.

SEMESTER- VII

Course Type	Course Code	Title of Course	Pre-requisite Course, if any	Periods/Week	Marks	Duration of Exam	Credits

			Title	Code	L	T	P	Total	Continuous Evaluation	End Sem Examination	Total		
Compulsory Courses													
PROJ	PROJ-CS-700	Project Phase - II/Industrial Project	NIL		0	0	10	10	200	100	300	2 hrs	5
PROJ	PROJ-CS-710	Summer Internship-III	NIL		0	0	2	2	100	100	200	2 hrs	2
TOTAL							**12**	**12**	**300**	**200**	**500**	**4**	**07**
Elective Courses *													
Domain Specific	BCS-DS-721	Simulation and Modelling	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-771	Simulation and Modelling Lab	NIL		0	0	2	2	50	50	100	2 Hrs	1
	BCS-DS-734	Automation and Robotics	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-723	Parallel and Distributed Algorithms	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-724	Advanced Computer Networks	Computer Networks	BCS-DS-405	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-725	Network Security & Management	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-726	Distributed Operating System	Operating Systems	BCS-DS-403	3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-727	Data Science	NIL		3	0	0	3	100	100	200	3 hrs	3
	BCS-DS-728	Soft Computing	NIL		3	0	0	3	100	100	200	3 hrs	3
Domain Specific-SEAC (Data Science)	BCS-DS-730	Big Data Analytics	NIL		2	0	0	2	100	100	200	3 hrs	2
	BCS-DS-772	Big Data Analytics Lab	NIL		0	0	2	2	50	50	100	2 Hours	1
	BCS-DS-742	Computing Systems for Data Processing	NIL	3	0	0	3	100	100	200	3 hrs	3	3
	BCS-DS-743	Optimization for Data Science	NIL	3	0	0	3	100	100	200	3 hrs	3	3
	BCS-DS-707	Devops	NIL		2	0	0	2	100	100	200	3 hrs	2
	BCS-DS-754	Devops Lab	NIL		0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-737	Applied Machine Learning	Machine Learning	BCS-DS-602	2	0	0	2	100	100	200	3 hrs	2
	BCS-DS-776	Applied Machine Learning Lab	Machine Learning Lab	BCS-DS-652	0	0	2	2	50	50	100	2 hrs	1
	BCS-DS-738	Pattern Matching	Digital Image Processing	BCS-DS-631	2	0	0	2	100	100	200	3 hrs	2
	BCS-DS-777	Pattern Matching Lab	Digital Image Processing	BCS-DS-631	0	0	2	2	50	50	100	2 hrs	1

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic,

on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits (28) and for the category of Elective Courses under University Rules.		

SEMESTER- VIII

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Continuous	End Sem.	Total		
Compulsory Courses													
PROJ	PROJ-CS-800	Internship –III			24 weeks				200	100	300	2 hrs	10
OR													
Elective Courses *													
Domain Specific	BCS-DS-822	Fuzzy Theory	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-823	Computational Linguistics and Natural Language Processing	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-824	Cryptography and Network Security	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-825	Machine Learning with Big Data	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-872	Machine Learning with Big Data LAB	NIL		0	0	2	2	50	50	100	2hrs	1
	BCS-DS-826	Wireless and AD-Hoc Network	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-827	Advanced Computer Architecture	Computer Organization & Architecture	BCS-DS-402	3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-828	Neural Networks and Deep Learning	NIL		3	0	0	3	100	100	200	3Hrs	3
	BCS-DS-829	Advanced Data Warehouse and Data Mining	Data Warehouse and Data	BCS-DS-531 & BCS-DS-	3	0	0	3	100	100	200	3Hrs	3

			Mining	632									
	BCS-DS-830	Grid Computing	NIL		3	0	0	3	100	100	200	3Hrs	3

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) , Microsoft certifications and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits (28) and for the category of Elective Courses under University Rules.

SEMESTER – I

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A++' Grade University

BPH-106: PHYSICS FOR ENGINEERS

Periods/week	Credits	Max. Marks	: 200
L: 3 T:0	3	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		End Term Examination	: 100

Pre-requisite: Basic knowledge of 10+2 level Physics
Course Type: Basic Sciences

Course Outcomes: The students will be able to:

BPH-106.1 discuss and explain the key concepts and principles of quantum physics, lasers and optical fibres
BPH-106.2 apply the basic concepts of semiconductors and devices based on them
BPH-106.3 analyze the structure, characterization techniques and applications of advanced material.
BPH-106.4 recall the basic concept of electromagnetism and understand their applications to the theoryof electromagnetic waves.

Unit-1 Semiconductors (8 Lectures)

Physical properties of semiconductors, direct and indirect band gap semiconductors, compound semiconductors, organic and inorganic semiconductors, Fermi level and Fermi energy, occupation probability, concentration of charge carriers, generation and recombination, carrier transport: drift and diffusion, energy band diagram of unbiased and biased P N Junction, Light Emitting Diode, Photodetectors - p-n photodiode, PIN, Photoconductivity, Effect of impurity & Traps, Photovoltaic effect and Solar cell.

Unit-2 Quantum Physics (8 Lectures)

Limitations of classical physics, Black-body radiations, Planck's hypothesis, Photo-electric effect, Compton effect, Uncertainty principle, Matter waves, Phase and group velocity, Schrodinger's equations (time dependent and independent), Particle in a box (motion in one dimension), Basics of quantum statistics.

Unit-3 Lasers and Optical Fibres (8 Lectures)

Introduction to laser, Spontaneous and stimulated emissions of radiations, Einstein's coefficients and relation among them, Population inversion and laser pumping, Characteristics of lasers, Components of laser, He-Ne laser, Semiconductor laser, Applications of laser.

Introduction to optical fibres, Acceptance angle and acceptance cone, Numerical aperture, Classification of fibres, Attenuation, Losses associated with optical fibres, Merits and applications of optical fibres.

UNIT 4: Advance Material and Synthesis (6 Lectures)

Introduction to nanomaterials, Nano-science and nano-technology, Two main approaches in nanotechnology, Bottom up technique, Top down technique, Quantum dot and graphene, Methods to produce Nanomaterials, Chemical vapour deposition, Sol-gel process, Molecular beam epitaxy, Physical and chemical properties of nanomaterials, Carbon nanotubes: single and multi-walled nanotubes, Synthesis of Nanotubes: carbon arc method, Laser evaporation method, Sputtering, applications of advanced materials.

UNIT 5: Investigating Techniques (6 Lectures)

Properties of X-Ray,Braggs' Law, Bragg's Spectrometer, Rutherford Back Scattering, Raman effect and Raman spectroscopy, Hall effect, Vander Pauw measurements for carrier density, resistivity, Hot-point probe measurement, AFM, SEM, photoluminescence spectroscopy, band gap by UV-Vis spectroscopy.

Unit-6 Electrodynamics (8 Lectures)

Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential. Solutions of Laplace equation in one dimension, Dielectric Polarization and Dielectric constant, Piezoelectricity, Bio-Savart law and Ampere's circuital theorem, Continuity equation for current densities, Displacement current, Maxwell's equations,

Electromagnetic energy – Flow of energy and Poynting vector, The wave equation; Plane electromagnetic waves in vacuum, their transverse nature, Energy carried by electromagnetic waves.

Text Books/ Reference Books:

1. P. Bhattacharya,2017, Semiconductor Optoelectronic Devices, Pearson education.
2. D.J Griffiths, 2015, Introduction to Electrodynamics, Pearson education.
3. Avadhanulu and Kshirsagar,2014, A textbook of Engineering Physics S. Chand.
4. S.P. Taneja,2018, Modern Physics for Engineers, R. Chand & Co.
5. Mark Ratner and Daniel Ratner, 2003,Nanotechnology, Pearson.
6. M.N.O. Sadiku, 2015, Elements of Electromagnetics, Asian Edition, Oxford Higher Education.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Assignments, Sessional and End Semester Examination paper will consist of various difficulty levels to accommodate the different capabilities of students. Assessment should cover all course outcomes and upper limit for lower order skills will be 40% (for knowledge-oriented questions). However, weightage for different cognitive levels in the question papers can vary.

Instructions for paper setting: The paper setter must ensure the coverage of entire syllabus while setting the question papers and mention the learning outcomes across each section to be measured by the examination. Weightage of the sections may vary as per the number of respective lecture hours mentioned in the syllabus.Action verbs should be used from Bloom's Taxonomy while designing question papers.

Course articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
BPH-106.1	2	2	1	2	3	-	-	-	-	-	2	--	--	--
BPH-106.2	3	1	3	-	2	1	1	-	-	-	-	--	--	--
BPH-106.3	3	2	2	-	2	2	1	-	-	-	-	--	--	--
BPH-106.4	3	3	3	1	1	3	1	-	-	-	-	--	--	--

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)
NAAC 'A++' Grade University

BMA-101: Mathematics- I

Periods/week Credits	Max. Marks : 200
L: 3 T: 1 4	Continuous Evaluation : 100
Duration of Examination: 3 Hrs	End Sem Examination : 100

Pre-requisites: The students must have the knowledge of mathematical concepts of Intermediate level.
Course Type: Basic Sciences

Course Outcomes: Students will be able to-
BMA-101.1. Draw the role of mathematics which allows both algebraic and graphical representations of a function.
BMA-101.2. Define the terminology of Integration, Differential Equations, Matrices and Vectors
BMA-101.3. Explain improper integrals, power series, linear system of equations and vector space.
BMA-101.4. Use the knowledge of Beta and Gamma Functions, rank of matrices, expansion of functions and diagonalization.
BMA-101.5. Apply the concepts of integration, differentiation, matrices and vectors to solve real life problems.
BMA-101.6. Find the surface area and maxima and minima of a function.

PART-A

Unit 1: Integral Calculus:
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Unit 2: Differential Calculus:
Rolle's theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders, indeterminate forms and L'Hospital's rule, Maxima and minima.

Unit 3: Matrices:
Matrices, Vectors: addition and scalar multiplication, matrix multiplication, Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

PART-B

Unit 4: Vector Spaces-I
Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.

Unit 5: Vector spaces-II
Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization, inner product spaces, Gram-Schmidt Orthogonalization.

Text Books/Reference Books:

1. G.B. Thomas and R.L. Finney, 2002, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint.
2. Erwin kreyszig, 2006, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
3. Veerarajan T.,2008, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
4. Ramana B.V.,2010, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint.
5. D. Poole, 2005, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole.
6. N.P. Bali and Manish Goyal, 2008, A textbook of Engineering Mathematics, Laxmi Publications, Reprint.
7. B.S. Grewal, 2010, Higher Engineering Mathematics, Khanna Publishers, 36th Edition.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora, 2005, An introduction to Linear Algebra, Affiliated East–West press.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B. Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:
Assignment/Tutorials.
Sessional tests.
Surprise questions during lectures/Class Performance.
End Semester Examination.

Course Articulation Matrix:

CO Statement (BMA-101)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
BMA-101.1	3	3	1	2	2	--	--	--	--	--	--	2	--	--	--
BMA-101.2	3	3	1	2	2	--	--	--	--	--	--	1	--	--	--
BMA-101.3	3	3	2	2	3	--	--	--	--	--	--	2	--	--	--
BMA-101.4	3	2	1	1	2	--	--	--	--	--	--	1	--	--	--
BMA-101.5	3	3	2	2	3	--	--	--	--	--	--	2	--	--	--
BMA-101.6	3	3	2	1	3	--	--	--	--	--	--	2	--	--	--

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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BEE-103: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Periods/week Credits	Max. Marks : 200
L: 3 T:0 3	Continuos Evaluation : 100
Duration of Examination: 3 Hours	End Semester Exam : 100

Pre-requisites
Course Type: Engineering Science

Course Outcomes: After completion of this course the students will be able to
BEE-103.1 understand the basic electrical laws, theorems, components of electrical system, earthing and working of batteries.
BEE-103.2 apply the basic theorems and laws for solving both dc and ac networks.
BEE-103.3 learn the construction and working of transformers and electrical machines
BEE-103.4 understand the working of semiconductor devices and digital circuits

PART-A

Unit 1: DC CIRCUITS (8 hours)
1.1 Electrical circuit elements (R, L and C), voltage and current sources,
1,2 Kirchoff Voltage and Current Laws,
1.3 Analysis of simple circuits (two loops) with dc excitation ,
1.4 Superposition Theorem,
1.5 Thevenin's Theorem,
1.6 Norton's Theorem,
1.7 Time domain analysis of first order system- RL circuit,
1.8 Time domain analysis of first order system- RC circuit.

Unit 2: AC CIRCUITS (7 hours)
2.1 Single Phase-AC Generation,
2.2 Sinusoidal Waveform- peak value average and rms values
2.3 Phasor representation, L, C, RL, RC circuit
2.4 RLC Series Circuits
2.5 Power factor, Real power, Reactive power and Apparent power
2.6 Resonance
2.7 Three Phase Emf Generation, Delta and Star Connections
2.8 Voltage and current relation in star and delta connections

Unit 3: TRANSFORMERS AND ELECTRICAL MACHINES (7 hours)
3.1Working Principle, Construction and Emf Equation of transformer
3.2 Ideal and Practical transformer,
3.3 Losses and Efficiency of transformer
3.4 Construction and working of DC motor and generator
3.5 Speed Control of Dc shunt motor
3.6 Construction and working of a three-phase induction motor
3.7 Single-phase induction motor working and types

PART-B

Unit 4: SEMICONDUCTOR DEVICES (6 hours)
4.1 Power semiconductor devices- power diodes, Bipolar transistor,
4.2 Field Effect transistor, MOSFET, IGBT
4.3 SCR-VI characteristics, and gate characteristics
4.4 Introduction to Power Converters -Diode rectifier, controlled rectifier
4.5 Inverter, DC to DC converters

Unit 5: DIGITAL CIRCUITS (7 hours)
5.1 Number systems,

5.2 conversion of bases (Binary, Decimal, Hexa, Octal),
5.3,Basic logic gates, AND OR, NAND , NOR –truth tables
5.4 Boolean algebra,
5.5De Morgan's theorem
5.6Introduction to flip-flopsSR,JK, D type,
5.7 Introduction to Counters and Shift registers

Unit 6: ELECTRICAL INSTALLATIONS and BATTERIES (5 hours)
6.1Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB,
6.2 Necessity and Standards of earthing, Methods of Earthing
6.3 Types of Batteries, capacity and efficiency (ampere hour and watt hour)
6.4Working of Lead Acid Battery, Charging and Discharging
6.5 Working of Nickel Cadmium battery
6.6Working of Lithium Ion Battery

Text Books/ Reference Books:

1 J. Nagrath, D. P. Kothari ,2007, Basic Electrical Engineering, TMH.
2 S. Nath Chakrabarti, C. K. Chanda , 2009, Basic Electrical Engineering, TMH,2009.
3 B. L. Thereja , 2005, Electrical Technology Vol.1, S Chand.
4 S K Sahadev ,2015, Basic Electrical Engineering, Pearson India
5 V. N. Mittal, Aravind Mittal, 2007, Basic Electrical Engineering,TMH 2007.
6 SantiramKal, 2002, Basic Electronics- Devices, Circuits and it Fundamentals, Prentice Hall, India.
7 T. L. Floyd (2017), Digital Fundamentals, Pearson Education.
8 H. C. Rai, (2018) Power Electronics and Industrial Applications, CBS Publications
9 S.M. Sze, M.K. Lee, (2015), Semiconductor Devices, Physics and Technology, Wiley
10 V K Mehta, R Mehta 2014, Principles of Electronics, S Chand.

Software required/Weblinks
https://nptel.ac.in/courses/108105112
https://nptel.ac.in/courses/108108076/
https://nptel.ac.in/courses/108106181
https://nptel.ac.in/courses/108105113

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B. Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Se Sessional- I	3 30%
Se Sessional- II	3 330%
A Assignment	2 20%
C Class Performance	1 10%
At Attendance	1 10%

COURSE ARTICULATION MATRIX for CSE

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
BEE-	3	3	2	1	2	-	-	-	-	-	-	2	2	3	2
BEE-103.2	3	3	3	1	2	-	-	-	-	-	-	2	2	3	2
BEE-103.3	3	3	3	1	2	-	-	-	-	-	-	2	2	3	2
BEE-103.4	3	3	3	1	2	-	-	-	-	-	-	2	1	1	1

NAAC 'A++' Grade University

BCS-100A: Artificial Intelligence for Engineers

Periods/week	Credits	Max. Marks	: 200
L :2 T: 0	2.0	Continuous Assessment	: 100
Duration of Exam: 3 Hrs		End Term Examination	: 100

Pre-Requisite: Nil
Course Type: Engineering Science Course

Course Outcomes: The Students will be able to-
BCS-100A.1 understand evolution of Artificial Intelligence.
BCS-100A.2 familiarize with artificial intelligence problems and their formulations.
BCS-100A.3 understand Intelligent system, Agents & its environment.
BCS-100A.4 understand applications of artificial intelligence.

Unit-1: AI Introduction, Background and History
1.1 Introduction to AI
1.2 Foundations of AI
1.3 AI Evolution
1.4 Introduction to AI programming languages

Unit-2: AI Problem Formulation
2.1 AI problem formulation
2.2 Problem characteristics
2.3 Production System
2.4 Production System characteristics

Unit 3: Intelligent System & Agents
3.1 Introduction to intelligence system
3.2 Types of Intelligence
3.3 Difference between Human and Machine learning
3.4 Introduction to Agent & environment
3.5 Structure of Intelligent Agent
3.6 Nature and Properties of Environment.

Unit-4: AI Applications
4.1 Robotics
4.2 Natural Language Processing
4.3Computer Vision
4.4 Health Care
4.5 Education
4.6 Expert System

Text Books / Reference Books:

1. Elain Rich and Kevin Knight (2009), Artificial Intelligence, 3rdedition, Tata McGraw Hill.
2. Stuart J.Russel and Peter Norvig (2009), Artificial Intelligence-A modern approach: 3rd edition, Pearson.
3. Patrick Henry Winston (1992), Artificial Intelligence , 3rdedition, , Pearson.
4. George F Luger, (2009), Artificial Intelligence :Structures and Strategies for Complex Problem Solving , University of New Mexico,6th edition, Pearson.
5. V S Janakiraman, Parerback (2005), Foundations of Artificial Intelligence And Expert Systems : 3rd edition, Macmillan India Limited

Software required/Weblinks:
http://artint.info/html/ArtInt_351.html
http://www.tutorialspoint.com/artificial_intelligence/

http://www.compinfo-center.com/tpai-t.htm

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit) Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

CO Statement (BCS-100A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
BCS-100A.1	2	2	1	2									2	2	3
BCS-100A.2	2	3	2	3									2	2	3
BCS-100A.3	3	2	2	2									3	3	3
BCS-100A.4	3	3	2	3									2	3	3

NAAC 'A++' Grade University

BME-101A: ENGINEERING GRAPHICS & DESIGN

Periods/week Credits	Max. Marks : 200
L: 0 T: 0 P: 4 2	Internal/Continuous Assessment : 100
Duration of Examination: 3 Hrs	End Semester Exam : 100

Prerequisites: NIL
Course Type: Engineering Science Course
Course Coordinator / Co-Coordinator:

Course Outcomes: After completion of this course the students will be able to

BME-101A.1 understand the role and importance of Engineering Graphics, design/drafting in cognitive development.
BME-101A.2 conceptualize engineering drawing and descriptive geometry to understand different components and machineries.
BME-101A.3 visualize objects with the help of engineering principles, projection theories including their applications to solve problems related to engineering and production.
BME-101A.4 develop capability of understanding engineering drawing problems and implementation of respective solution.
BME-101A.5 develop capability of selection of solutions for a given design problem.
BME-101A.6 develop of capability of designing a product or assembly with its various components with a systematic design approach

Theory (Detailed Content)

Traditional Engineering Graphics:
Principles o f Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles;Isometric Projection;Surface Development;Perspective;Reading a Drawing; SectionalViews;Dimensioning&Tolerances; TrueLength,Angle;intersection, Shortest Distance.
(**Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory**)

Part-A

Unit 1: Introduction to Engineering Drawing, Orthographic Projections
Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales; Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Unit 2: Projections of Regular Solids & Sections and Sectional Views of Right Angular Solids
Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

Unit 3: Isometric Projections
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric
Views to Orthographic Views and Vice-versa, Conventions;

Theory (Detailed Content)
Computer Graphics
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

(**Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory**)

Part-B

Unit 4: Overview of Computer Graphics, Customization & CAD Drawing
Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids; consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Unit 5: Annotations, layering, other functions
Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Unit 6: Demonstration of a simple team design project
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying color coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. (Corresponding set of) CAD Software Theory and User Manuals

Reference Books:

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
2. Narayana, K.L.&P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

Weblinks:
https://nptel.ac.in/courses/112103019/
https://nptel.ac.in/courses/112104172/

Assessment Tools:
Surprise questions during lab/Class Performance
Term end examination/viva

Course Articulation Matrix

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BME-101A.1	2	1	1	1	1	2	1	2	1	1	2	3	3	3	2
BME-101A.2	2	2	3	1	1	2	2	2	2	2	3	2	3	2	2
BME-101A.3	2	2	2	2	2	1	2	1	3	2	2	2	3	2	1
BME-101A.4	3	3	2	3	2	1	2	2	1	1	2	1	3	2	2
BME-101A.5	3	3	2	3	2	1	2	1	1	1	2	1	3	2	2
BME-101A.6	2	1	3	2	3	2	2	2	3	2	2	1	3	2	2

BPH-151A: PHYSICS LAB

Periods/week Credits	Max. Marks : 100
P: 2 1	Internal : 50
Duration of Examination: 2 Hrs	External : 50

Pre-requisite: Basic knowledge of 10+2 level Physics
Course Type: Basic Sciences Courses

Course Outcomes: The students will be able to:
BPH-151A.1 calculate zero error, least count, maximum percentage error, percentage error and understand their importance
BPH-151A.2 understand the principle, concept and working of the experiments
BPH-151A.3 rearrange/assemble the different components of a device or a circuit
BPH-151A.4 describe the methodology of science and the relationship between observation and theory

List of Experiments:

1. To calculate the hysteresis loss and magnetic susceptibility by tracingB- H curve.
2. To determine the value of Planck's constant h by a photo cell.
3. To determine the grating element of a given grating by using LASER.
4. To study Hall Effect in a semiconductor and to find (i) Hall voltage and Hall coefficient (ii) number of charge carriers per unit volume (iii) mobility.
5. To draw the characteristics of a solar cell and to find the fill factor.
6. To find the band gap of an intrinsic semiconductor using four probe method.
7. To draw the V-I characteristics of a PIN diode.
8. To determine numerical aperture of an optical fibre.
9. To determine the volume magnetic susceptibility of manganese sulphate solution at different concentrations.
10. To find the charge to mass (e/m) ratio of an electron.
11. To study the resonance phenomena in LCR circuits.
12. To study the variation of magnetic field from Helmholtz coil.
13. To determine the moment of inertia of a flywheel.
14. To determine the Young's modulus of the material of a given beam supported on two knife-edges and loaded at the middle point.
15. To determine the Modulus of Rigidity of a wire by Maxwell's Needle.

Text Books/References:
1. S. L. Gupta & V. Kumar, Practical Physics, 2018, Pragati Prakashan.
2. S.L. Arora, B.SC, Practical Physics, 2010, S. Chand.
3. NPTEL video lectures for Experimental Physics.

Instructions for Exam: One experiment out of 10 given randomly needs to be performed in exams.

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Distribution of Continuous Evaluation:

Viva- I	30%
Viva- II	30%
File/Records	20%
Class Work/ Performance	10%

Attendance	10%

Course articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BPH-151A.1	3	1		1				1	1	1		3	2	1	
BPH-151A.2	2		2		2				1	1		2	1	1	
BPH-151A.3	2	3	2	3	3				3		1	3	2		2
BPH-151A.4	3	1	2		1		1	1	1	1		3	1	1	

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BEE-151A: BASIC ELECTRICAL ENGINEERING LAB

Periods/week Credits	Max. Marks : 100
P: 2 1	Internal/Continuous Evaluation: 50
Duration of Examination: 2 Hours	End Semester Exam : 50

Pre-requisite: Basic knowledge of 10+2 level Physics
Course Type: Engineering Sciences Courses

Course Outcomes: The students will be able to

BEE-151A.1 familiarize with the measuring instruments, breadboard, CRO, components of LT installation
BEE-151A.2 understand the transformers connection both single and three phase.
BEE-151A.3 study the working principles of electric machines and power converters
BEE-151A.4design a simple PCB with software.

LIST OF EXPERIMENTS:

1. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors and verification of basic laws.
2. To measure the steady-state and transient time-response of R-L/R-L circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
3. To examine sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage.
4. To find the resonance frequency inR-L-C circuits..
5. To observe the no-load current waveform of transformer on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).
6. To perform Load test on a transformer: measurement of primary and secondary voltages and currents, and power.
7. To connect Three-phase transformers in Star and Delta and verify voltage and current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side and to measure three-phase power in balanced three-phase circuits.
8. Identification of various types of Printed Circuit Boards (PCB) and soldering techniques.
9. Introduction to PCB design software.
10. PCB Lab a) Artwork & printing of simple PCB b) Etching & drilling of PCB.
11. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
12. To draw Torque -Speed Characteristic of dc motor.
13. To find Synchronous speed of two and four-pole three-phase induction motors, check Direction reversal by change of phase-sequence of connections and to draw Torque-Slip Characteristic of an induction motor.
14. To Study components of LT, switchgear- MCB, ELCB, MCCB.
15. To Study DC-DC Converter.

Text Books:

Dr. N K Jain ,2010, A text book of Practicals in Electrical Engineering, Dhanpatrai Publishing Co.

Instructions for Exam: Every student needs to complete 10 experiments in a semester. One experiment out of 10 given randomly needs to be performed in exams.

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Continuous Evaluation

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

COURSE ARTICULATION MATRIX

CO Statement (BEE-151A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BEE-151A.1	3	3	2	1	1	-	-	-	-	-	-	2	3	1	1
BEE-151A.2	3	3	3	1	1	-	-	-	-	-	-	2	3	1	1
BEE-151A.3	3	3	3	1	1	-	-	-	-	-	-	2	3	3	1
BEE-151A.4	3	3	3	1	1	-	-	-	-	-	-	2	3	1	1

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CDC-PC-101: Professional Communication - I

Periods/week Credits Max. Marks : 100
L: 2 T: 0 2 Continuous Evaluation: 50
Duration of Examination: 1.5 Hrs End Semester Examination: 50

Student Outcomes
CDC-PC-101.1: Students will be able to develop all-round personality by mastering interpersonal skills to function effectively in different circumstances.
CDC-PC-101.2: Students will be able to demonstrate effective communication through grammatically correct language.
CDC-PC-101.3: Students will be able to apply effective listening and speaking skills in real life scenarios.

Unit 1: **Attitudinal Communication**

1.1 Attitude and its Impact on Communication
1.2 Courtesy &Politeness in Communication
1.3 Diversity & Inclusion – Bullying, Cultural Sensitivity, Stereotypes, Sexual Harassment, LGBTQ, Respect, Chivalry, Racial & Gender Discrimination, Disability Harassment, Inclusion.
1.4 Power Dressing

Unit 2**: Syntactical Communication - I**

2.1 Common errors in communication
2.2 Identification of word class
2.3 Errors & rectifications in
2.3.1 Article usage
2.3.2.Tenses usage - Present Perfect vs. Past Simple vs. Past Perfect
2.3.2 Subject Verb Agreement

Unit 3**: Phonetics**

3.1 Impact of First Language Influence
3.2 Tone
3.3 Intonation
3.4 Rate of Speech
3.5 Pronunciation: Vowels & Consonant sounds

Unit 4**: Developing Communication Skills -I (Listening & Speaking)**

4.1 Concept of LSRW: Importance of LSRW in communication.
4.2 Listening Skills : Real Life challenges, Barriers to Listening
4.3 Speaking : Self Introduction, Interview, GD, Resume

Continuous EvaluationDistribution:-

Sessional (Average of Sessional I & Sessional II)	30 marks
Assignment	10 marks
Class performance	5 marks
Attendance	5 marks

Course Articulation Matrix

CO Statement (CDC PC101)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**O10**	**O11**	**O12**	**PSO 1**	**PSO 2**	**PSO 3**
CDC-PC-101.1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CDC-PC-101.2	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-
CDC-PC-101.3	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-

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BHM-MC-001: CONSTITUTION OF INDIA

Periods/week Credits	Max. Marks : 100
L :0 T: 1 AP	Continuous Evaluation: 50
Duration of Exam: 2 Hrs	End Semester Exam : 50

Pre-Requisite: Nil
Course Type: HSMC

Unit-1: Background:
India's struggle for independence, Formation of the Constituent Assembly, The Union and its Territory : Nomenclature, Formation of New States and Alteration of Areas, Citizenship : Citizenship at the Commencement of the Constitution, Rights of Citizenship of certain persons, Rights of Citizenship of certain persons of Indian origin residing outside India, Continuance of the rights of Citizenship, Parliament to regulate the right of the Citizenship by law.

Unit-2: Fundamental Rights and Directive Principles :
Definition, Laws inconsistent with or in derogation of the Fundamental Rights, Equality before law, Prohibition of discrimination on grounds of religion, race, caste, sex or place of birth, Equality of opportunity in matters of public employment, Abolition of untouchability, Abolition of Titles- Right to Freedom, Right against Exploitation, Right to freedom of religion, Cultural and Educational rights, Right to constitutional remedies, Directive principles of State Policy : Definition, Right to work, Right to education and to public assistance in certain cases, provisions for just and humane condition of work and maternity relief, uniform civil code for the citizens, protection and improvement of environment and safeguarding of forests and wildlife, protection of monuments and places and objects of national importance, separation of judiciary from executive, promotion of international peace and security and Fundamental Duties.

Unit-3: The Union:
The executive, The President and Vice President of India, Council of Ministers, Attorney General for India, Parliament, Legislative procedure, The Union Judiciary: Establishment and constitution of Supreme Court, Powers and Functions of Supreme Court, Original Jurisdiction of the Supreme Court, The States : Definition, The Governor, Council of Ministers, The Advocate General for the State, The State Legislature, Legislative Procedure, High Courts in the State, The Union Territories, The Panchayats, Municipalities, Relations between the Union and the States.

Unit-4:Services under the Union and the States:
Services, Public Service Commissions, Elections: Election Commission of India, Emergency Provisions : Proclamation of Emergency, Amendment of the Constitution, Temporary, Transitional and Special Provisions, Schedules : First to Tenth Schedule and Miscellaneous.

Text books/reference books:

1. R. Bhargava, (2008) 'Introduction: Outline of a Political Theory of the Indian Constitution', in R. Bhargava (ed.) Politics and Ethics of the Indian Constitution, New Delhi: Oxford University Press, pp. 1-40.
2. G. Austin, (2000) 'The Social Revolution and the First Amendment', in Working a Democratic Constitution, New Delhi: Oxford University Press, pp. 69-98.
3. A. Sibal, (2010) 'From Niti to Nyaya,' Seminar, Issue 615, pp 28-34.
4. B. Shankar and V. Rodrigues, (2011) 'The Changing Conception of Representation: Issues, Concerns and Institutions', in The Indian Parliament: A Democracy at Work, New Delhi: Oxford University Press, pp. 105-173.
5. V. Hewitt and S. Rai, (2010) 'Parliament', in P. Mehta and N. Jayal (eds.) The Oxford Companion to Politics in India, New Delhi: Oxford University Press, pp. 28-42.
6. J. Manor, (2005) 'The Presidency', in D. Kapur and P. Mehta P. (eds.) Public Institutions in India, New Delhi: Oxford University Press, pp.105-127.
7. J. Manor, (1994) 'The Prime Minister and the President', in B. Dua and J. Manor (eds.) Nehru to the Nineties: The Changing Office of the Prime Minister in India, Vancouver: University of British Columbia Press, pp. 20-47.
8. U. Baxi, (2010) 'The Judiciary as a Resource for Indian Democracy', Seminar, Issue 615, pp. 61-67.
   R. Ramachandran, (2006) 'The Supreme Court and the Basic Structure Doctrine' in B. Kirpal et.al (eds.) Supreme but not Infallible: Essays in Honour of the Supreme Court of India, New Delhi: Oxford University Press, pp. 107-133.

9. M. Singh, and R. Saxena (eds.), (2011) 'Towards Greater Federalization,' in Indian Politics: Constitutional Foundations and Institutional Functioning, Delhi: PHI Learning Private Ltd., pp. 166-195.
10. V. Marwah, (1995) 'Use and Abuse of Emergency Powers: The Indian Experience', in B. Arora and D. Verney (eds.) Multiple Identities in a Single State: Indian Federalism in a Comparative Perspective, Delhi: Konark, pp. 136-159.
11. B. Sharma, (2010) 'The 1990s: Great Expectations'; 'The 2000s: Disillusionment Unfathomable', in Unbroken History of Broken Promises: Indian State and Tribal People, Delhi: Freedom Press and Sahyog Pustak Kuteer, pp. 64-91.
12. P. deSouza, (2002) 'Decentralization and Local Government: The Second Wind of Democracy in India', in Z. Hasan, E. Sridharan and R. Sudarshan (eds.) India's Living Constitution: Ideas, Practices and Controversies, New Delhi: Permanent Black, pp. 370-404.
13. M. John, (2007) 'Women in Power? Gender, Caste and Politics of Local Urban Governance', in Economic and Political Weekly, Vol. 42(39), pp. 3986-3993

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

SEMESTER – II

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BCH-106: CHEMISTRY FOR ENGINEERS

Periods/week	Credits		
L: 2	T: 0	2	Max. Marks : 200
Duration of Examination: 3 Hrs			Continuous Evaluation : 100
			End Term Examination : 100

Pre-requisite: Basic knowledge of 10+2 level Chemistry
Course Type: Basic Sciences

Course Outcomes: The course will enable the student to-

BCH-106.1. Apply fundamental principles to predict the structure, stereochemistry, bonding and general properties of materials.

BCH-106.2.Predict potential applications and practical utility of chemistry in different areas and propose suitable analytical techniques for practical applications.

BCH-106.3. Develop the understanding of water treatment techniques, electrochemical cells and combustion technology.

Unit 1: Water Treatment Chemistry (5 Lectures)

Impurities in water, Drinking Water quality standards, Hardness, types and its determination by EDTA method, Alkalinity and its determination, numerical problems based on hardness & alkalinity, Water softening methods: zeolite, ion-exchange process, Desalination of water: Reverse osmosis (RO) & Electro-dialysis process

Unit 2: Electrochemical cells and Fuels (5 Lectures)

Basic concepts of cells, Primary cells, Secondary cells and batteries, Fuel cells, Fuels and their types, Combustion technology

Unit 3: Phase Rule and its applications (4 Lectures)

3.1 Terminology of Gibb's phase rule and problems based on phase rule equation, One component system (water), Two component Eutectic system (Pb-Ag), Industrial applications of phase diagrams

Unit 4: Atomic and molecular structure (5 Lectures)

Limitations of classical mechanics in treating atomic and molecular phenomena, Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and nanoparticles, Molecular orbital treatment for homo-nuclear diatomic molecules, Bonding in Coordination Compounds: Crystal field theory

Unit-5: Stereochemistry (4 Lectures)

Structural isomers and stereoisomers, Representations of 3 dimensional structures, Enantiomers, diastereomers, Absolute configurations and conformational analysis

Unit6: Analytical Techniques(5 Lectures)

Basic Principles of spectroscopy, UV- VIS spectroscopy and its applications, IR spectroscopy and its applications, Principle and analytical applications of Atomic Absorption spectroscopy, brief overview of Inductively coupled plasma mass spectrometry

Text Books/ Reference books/Web references:

1. P. C. Jain and Monica Jain, Engineering Chemistry, 2017, Dhanpat Rai Publishing Company.
2. Prasanta Rath, Subhendu Chakroborty, Chemistry, 2018, Cengage Learning Publishers.
3. B. H. Mahan,2010, University Chemistry, Pearson Education.
4. C. N. Banwell, 2008, Fundamentals of Molecular Spectroscopy, McGraw Hill Education India.
5. GourkrishnaDasmohapatra, 2019, Chemistry-I, Vikas Publishing.
6. https://nptel.ac.in/courses/103/108/103108138/
7. https://nptel.ac.in/courses/122/101/122101001/

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Assignments, Sessional and End Semester Examination paper will consist of various difficulty levels to accommodate the different capabilities of students. Assessment should cover all course outcomes and upper limit for lower order skills will be 40% (for knowledge-oriented questions). However, weightage for different cognitive levels in the question papers can vary.

Instructions for paper setting: The paper setter must ensure the coverage of entire syllabus while setting the question papers and mention the learning outcomes across each section to be measured by the examination. Weightage of the sections may vary as per the number of respective lecture hours mentioned in the syllabus.Action verbs should be used from Bloom's Taxonomy while designing question papers.

Course articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
BCH-106.1	3	3	1	-	1	-	-	-	-	-	-	2	1	-	-
BCH-106.2	3	3	2	-	2	2	2	-	-	-	-	2	-	1	-
BCH-106.3	3	3	2	-	2	2	2	-	-	-	-	2	1	-	1

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BMA-201: Mathematics- II (Probability and Statistics)

Periods/week	Credits	Max. Marks	: 200
L: 3 T: 1	4	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		End Sem Examination	: 100

Pre-requisites: The students must have the knowledge of basic concepts of probability of Intermediate level.
Course Type: Basic Sciences

Course Outcomes: Students will be able to-

BMA-201.1. Understand the role of mathematics in in the digital society.
BMA-201.2. Define the concepts of probability and random variables and various discrete and continuous probability distributions and their properties.
BMA-201.3. Demonstrate the knowledge of measures of central tendency, correlation and regression.
BMA-201.4. Explain the types of probability distributions with formulas or plotted through graphs for easy interpretation of the data.
BMA-201.5. Construct and examine the samples.
BMA-201.6. Apply statistical methods for studying data samples.

PART-A

Unit 1: Basic Probability

Probability spaces, conditional probability, independence, Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Unit 2: Continuous Probability Distributions

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Unit 3: Bivariate Distributions

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

PART-B

Unit 4: Basic Statistics

Measures of Central tendency: Moments, skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal, evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Unit 5: Applied Statistics

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Unit 6: Small Samples

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text Books/Reference Books

1. Erwin Kreyszig, 2006, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
2. P. G. Hoel, S. C. Port and C. J. Stone, 2003 (Reprint), Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, 2002, A First Course in Probability, 6th Ed., Pearson Education India.
4. W. Feller, 1968, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley.
5. N.P. Bali and Manish Goyal, Reprint 2010, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, 2000, Higher Engineering Mathematics, Khanna Publishers, 35th Edition.
7. Veerarajan T., 2010, Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B(one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:
Assignment/Tutorials.
Sessional tests.
Surprise questions during lectures/Class Performance.
End Sem Examination.

Course Articulation Matrix:

CO Statement (BMA-201)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
BMA-201.1	3	3	1	2	2	--	--	--	--	--	--	2	--	--	--
BMA-201.2	3	3	1	2	2	--	--	--	--	--	--	1	--	--	--
BMA-201.3	3	3	2	2	3	--	--	--	--	--	--	2	--	--	--
BMA-201.4	3	2	1	1	2	--	--	--	--	--	--	1	--	--	--
BMA-201.5	3	3	2	2	3	--	--	--	--	--	--	2	--	--	--
BMA-201.6	3	3	2	2	2	--	--	--	--	--	--	2	--	--	--

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
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NAAC 'A++' Grade University

BCS-101A: PROGRAMMING FOR PROBLEM SOLVING

Periods/week	Credits	Max. Marks : 200
L :3 T: 0	3.0	Continuous Evaluation : 100
Duration of Exam: 3 Hrs		End Term Examination : 100

Pre-Requisite: Basic Knowledge of Computers
Course Type: Engineering Science Course

Course Outcomes: The students will be able to-

BCS-101.1. Formulate simple algorithms for arithmetic and logical problems with correct logic.
BCS-101.2. Implement the conditional statement and ietration with understanding of concepts.
BCS-101.3. Decompose a problem into functions and able to understand use of functions.
BCS-101.4. Apply advance C programming techniques such as arrays, pointers, dynamic memory allocation, structures to develop solutions for particular problems.

PART- A

Unit-1: Introduction to Programming

1.1. Introduction to programming
1.2. Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
1.3. Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo code with examples.
1.4. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.
1.5. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions

Unit-2: Loops and Conditional Statements

2.1 Arithmetic expressions and precedence
2.2 Conditional Branching; Writing and evaluation of conditionals and consequent branching
2.3 Iteration and loops

Unit-3: Arrays and Structures

3.1 Arrays (1-D, 2-D):1 D array and function–Passing individual array elements to a function, passing individual array elements address to a function, passing whole 1d array to a function, 2D array and function, Passing individual array elements to a function, passing individual array elements address to a function, passing whole 2d array to a function
3.2 Character Arrays and Strings
3.3 Structures; Defining Structures
3.4 Array of Structures

PART –B

Unit-4: Functions

4.1 Functions (including using built in libraries)
4.2 Parameter passing in functions
4.3 call by value.
4.4 Passing arrays to functions: idea of call by reference
4.5 Recursion, as a different way of solving problems.
4.6 Example programs, such as Finding Factorial, Fibonacci series.

Unit-5: Basic Algorithms

5.1 Iterative Searching (Linear and Binary Search)
5.2 Basic Sorting Algorithms with implementation (Bubble, Insertion and Selection)
5.3 Finding roots of equations
5.4 Notion of order of complexity through example programs (no formal definition required)

Unit-6: Pointers and File Handling

6.1 Idea of pointers, Defining pointers,Pointer to an array,Array of pointers,Pointers and two dimensional arrays

6.2 Use of Pointers in self-referential structures

6.3 Notion of linked list (no implementation)

6.4 File Handling :Working with text files and Binary Files,File operations using std. library and system calls–File management I/O functions

Text Books / Reference Books:

1. Byron Gottfried, 2015, Schaum's Outline of Programming with C: 2nd Ed., McGraw-Hill.
2. E. Balaguruswamy, 1998, Programming in ANSI C: 2nd Ed., Tata McGraw-Hill.
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language:, 2nd Ed., PHI.

Software required/Weblinks:

Turbo C
www.tutorialpoint.com
www.nptel.com
www.w3schools.com

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit) Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX :

CO Statement (BCS-101A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BCS-101A.1	2	3	2	-	2	-	-	-	-	-	-	3	1	1	-
BCS-101A.2	2	1	2	1	3	-	-	-	-	-	-	-	-	1	1
BCS-101A.3	-	1	2	-	1	2	-	-	-	-	-	1	3	2	1
BCS-101A.4	3	3	1	3	2	-	-	-	-	-	-	-	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BBT-100A: BIOLOGY FOR ENGINEERS

Periods/week Credits	Max. Marks: 200
L: 2T: 0P:0 02	Continuous Evaluation : 100
Duration of Examination: 3 Hrs	End Semester Examination:100

Pre-requisites: Knowledge of 10+2 Science
Course Type: Basic Sciences

Course Outcomes:
The students will be able to-

BBT-100A.1 Describe the taxonomic diversity of life forms and their functions.
BBT-100A.2 Assess the role of biomolecules in physiology and their applications for humankind.
BBT-100A.3 Illustrate the structural and functional organization of the human body.
BBT-100A.4 Apply the principles of biology and genetics for sustenance.

PART-A

Unit 1: The Living World
1.1 Origin of Life
1.2 Structural Organization of life forms
1.3 Microbes in daily life
1.4 Cell- The unit of Life
1.5 Human Evolution

Unit 2: Biomolecules and Applications
2.1 Carbohydrates, Proteins, Lipids (Types and roles)
2.2 Nucleic acids and their types
2.3 Enzymes and mechanism of action
2.4 Applications of biomolecules (Bioplastics, Vaccines, Alternative Proteins, Biodiesel, Biosensors)
2.5 Bioengineering (Bioprinting, Bioimaging, Bioremediation, Biomimics)

PART-B

Unit 3: Human Organ Systems and Biodesign
3.1 Brain as CPU
3.2 Heart as Pump System
3.3 Lungs as Purification System
3.4 Kidney as Filtration system
3.5 Muscular and skeletal systems as scaffolds

Unit 4: Science of Genome
4.1 DNA Replication and Central Dogma
4.2 DNA Sequencing and Applications
4.3 Mutations and Genetic Disorders
4.4 Computational Approach to Biology-Making sense of the Big Data, Types of Biological Dataset, Role of AI in Healthcare

Text/ Reference Books:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M,L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wileyand Sons
3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freemanand Company
4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering the entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each Unit). Students need to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BBT-100A.1	1	-	1	-	-	1	1	-	-	-	3	1	1	2	1	-
BBT-100A.2	2	2	1	2	2	2	2	-	-	-	3	3	3	3	2	-
BBT-100A.3	3	3	2	2	2	3	1	-	-	-	2	3	3	3	2	-
BBT-100A.4	3	3	3	2	2	3	3	-	-	1	3	3	3	1	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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NAAC 'A++' Grade University

BME-102: WORKSHOP/MANUFACTURING PRACTICES

Periods/week	Credits	Max. Marks :200
L: 0 T: 0P:4	2	Continuous Assessment :100
Duration of Examination:3Hrs		End Semester Exam :100

Prerequisites: basic knowledge of Science and Mathematics Course
Type: Engineering Science Course

Course Outcomes:
After completion of this course the students will be able to

BME-102.1	Learn the basic manufacturing/fabrication processes and develop skills to fabricate with their own hand.
BME-102.2	Understand how to operate various traditional and modern machine tools used inindustries.
BME-102.3	Apply knowledge of the dimensional accuracies and dimensional tolerances, basics of various measuring instruments, hand tools and cuttingtools.
BME-102.4	Acquire knowledge of safetymeasurements
BME-102.5	Understand the impact of manufacturing engineering solution.
BME-102.6	Assemble different mechanicalcomponent/parts

Lectures & Videos (10 Hrs)

(i) Detailed Content

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3lectures).
2. CNC machining, Additive manufacturing (1lecture)
3. Fitting operations & power tools (1lecture)
4. Electrical &Electronics (1lecture)
5. Carpentry (1lecture)
6. Plastic moulding, glass cutting (1lecture)
7. Metal casting (1lecture)
8. Welding (arc welding & gas welding), brazing (1lecture)

(ii) Workshop Practice: (60hours)

1. Machine shop (10hours)
2. Fitting shop (8hours)
3. Carpentry (6 hours)
4. Electrical & Electronics (8 hours)
5. Welding shop (8 hours) (Arc welding 4 hrs + gas welding 4hrs)
6. Casting (8hours)
7. Smithy (6hours)
8. Plastic moulding& Glass Cutting (6hours)

Students Project Fabrication

Students have to fabricate product from the assigned list with their own hands. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different workshop processes. The final product should be assembly of different components fabricated by different workshop practices.

For e.g. Tack-hammer; Project Display Stand; Pen stand, Screw Driver, Variable size Spanner, Electrical Extension Board with electronic circuits or any other product which should involve multiple workshop practices to fabricate a single product.

Each student will be issued the drawings of the product assembly along with the drawing of the sub-part assembly, mentioning the dimensions, tolerance, sub-products used.

Students should follow the process planning sheet of the product and get involved in different workshop practices to complete the jobs for final submission.

Note: Each student should do more than one product to get hands on experience of all the workshop practices.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elementsof Workshop Technology Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited,Mumbai.
2. Kalpakjian S.And StevenS. Schmid, "Manufacturing Engineeringand Technology", 4th edition, Pearson Education India Edition,2002.
3. Gowri P. Hariharan and A. Suresh Babu, ManufacturingTechnology" IPearsonEducation, 2008.

Reference Books:

1. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Weblinks:

https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-me21/

Instructions for setting of Paper Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BME-102.1	3	3	3	3	2	1	1	2	2	2	2	3	3	3	3	3
BME-102.2	3	3	3	3	3	2	1	2	2	2	2	2	2	2	2	2

BME-102.3	3	3	3	3	3	2	2	1	2	2	1	2	2	2	2	2
BME-102.4	2	2	2	2	3	2	1	1	2	1	2	2	3	2	2	2
BME-102.5	3	2	2	2	2	3	3	2	2	2	2	2	3	2	2	2
BME-102.6	3	3	3	2	2	1	2	2	2	3	2	2	2	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUE OF RESEARCH & STUDIES

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NAAC 'A++' Grade University

BCH-151A: CHEMISTRY LAB

Periods/week Credits — Max. Marks : 100
P: 2 1 — Continuous Evaluation : 50
Duration of Examination: 2 Hrs — End Term Examination : 50

Pre-requisite: Basic knowledge of 10+2 level Chemistry
Course Type: Basic Sciences Courses

Course Outcomes: The students will be able to:
BCH-151A.1. analyze the need and utility of the experiments.
BCH-151A.2. precise quantitative measurements using volumetric glassware, analytical balance, and prepare standards solutions independently.
BCH-151A.3. carry out experiments to check the hardness, alkalinity and chloride content of different water samples and interpret the results.
BCH-151A.4. employ the basic methods/techniques to measure surface tension, viscosity, conductance, emf, saponification value of different samples.

List of Experiments:

1. Preparation and standardization of volumetric solutions.
2. Determination of viscosity using Ostwald Viscometer.
3. Determination of hardness of water by EDTA method.
4. Determination of alkalinity of water.
5. Determination of strength of solution by Conductometric titration.
6. Determination of Ferrous ion concentration using Potentiometer.
7. Determine the percentage composition of given mixture of sodium hydroxide and sodium chloride.
8. Determination of viscosity of lubricating oils using Redwood viscometers.
9. Determination of chloride content of water.
10. Determination of surface tension using Stalagmometer.
11. Determination of saponification value of oils.
12. Determination of the partition coefficient of a substance between two immiscible liquids.

Text Books/ Reference books/Web references:

1, Sunita Rattan, 2011, **Experiments in Applied Chemistry**, S.K.Kataria& sons.
2. Shailendra K.Sinha,2014, Physical Chemistry A Laboratory Manual, Alpha Science International Limited.
3. https://vlab.amrita.edu/index.php?sub=2&brch=190
4.https://vlab.amrita.edu/index.php?sub=2&brch=193&sim=575&cnt=1

Instructions for Exam: One experiment out of 10 given randomly needs to be performed in exams.
Distribution of Continuous Evaluation:

Viva- I	30%
Viva- II	30%
File/Records	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

Course articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
BCH-151A.1	3	3	2	1	1	-	1	1	1	1	-	2	-	-	-
BCH-151A.2	3	3	2	1	2	-	1	1	1	1	-	2	-	-	-
BCH-151A.3	3	3	2	1	2	-	2	1	1	1	-	2	-	-	-
BCH-151A.4	3	3	2	1	1	-	1	1	1	1	-	2	-	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
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BCS-151A: PROGRAMMING FOR PROBLEM SOLVING LAB

Periods/week	Credits	Max. Marks	:100
P :2	1.0	Continuous Evaluation	: 50
Duration of Exam: 2 Hrs		End Term Examination	: 50

Co-Requisite: Programming for problem solving (BCS-101A)
Course Type: Engineering Science Course

Course Outcomes: Students will be able to-

BCS-151A.1.	Formulate the algorithms for simple problems in C language.
BCS-151A.2.	Understanding of syntax errors as reported by the compilers as well as logical errors.
BCS-151A.3.	Write iterative as well as recursive programs,implementing of arrays, strings and structures and various graph traversing algorithms.
BCS-151A.4.	Declare pointers of different types and able to understand the concept of file handling.

NOTE: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

List of Practicals:
Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value,call by refrence
Lab 7: Simple functions
Tutorial 8: Recursion, structure of recursive calls
Lab 8: Recursive functions
Tutorial 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 9: Programming for solving Numerical methods problems
Tutorial 10: Pointers, structures and dynamic memory allocation
Create a menu for student attendance monitoring system.
Lab 10: Pointers and structures
Tutorial 11: File handling
Lab 11: File operations
Create a database for an organization having the details of employees

Software required/Weblinks:
Turbo C
www.tutorialpoint.com
www.nptel.com
www.w3schools.com

Note: At least 5 more exercises to be given by the teacher concerned.

Distribution of Continuous Evaluation:

Viva- I	30%
Viva- II	30%
File/Records	20%
Class Work/ Performance	10%
Attendance	10%

Evaluation Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX :

CO Statement (BCS-151A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
BCS-151A.1	2	1	2	2	-	-	-	-	-	-	2	1	2	-	1
BCS-151A.2	3	-	-	3	2	-	-	-	-	-	-	-	2	3	3
BCS-151A.3	3	1	2	3	-	1	-	-	-	-	-	-	1	2	-
BCS-151A.4	2	3	1	2	3	-	-	-	-	-	1	1	3	2	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
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BCH-MC-002: EVS

Periods/week Credits	Max. Marks : 100
L: 0 T: 1 P: 0 AP	Continuous Evaluation : 50
Duration of Exam: 2 Hrs	End Sem Examination : 50

Pre-requisites: Basic knowledge of Environment related issues
Course Type: HSMC

Course Outcomes : Students will be able to-
BCH-MC-002.1: Comprehend various environmental issues through various activities.
BCH-MC-002.2: Understand that each and every action of ours reflects on the environment and collaborate in groups to suggest innovative ways to protect environment through project work/report writing.

Idea of an activity based course on environment protection is to sensitize the students on environment related issues through various activities. Students must understand that each and every action of ours reflects on the environment and vice versa.

Activities:
i) Small group meetings about conservation and management of natural resources, conservation of biodiversity, solid waste management and environmental remediation
ii) Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
iii) Expert talk
iv) Slogan writing /Poster making event
v) Cycle rally to create awareness on issues like pollution control, cleanliness, and waste management.
vi) Plantation activity
vii) Cleanliness drive
viii) Drive for segregation of waste
ix) Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
x) Environment protection related efforts

Distribution of marks:
Continuous Evaluation Marks
Evaluation based on participation in activities: 50 marks
End Sem Examination Marks
Field work, Report writing & Viva: 20+20+10 = 50 marks

Course Articulation Matrix

CO Statement (BCH-MC-002)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
BCH-MC-002.1	1	2	1	-	-	2	3	2	1	-	-	1	-	-	-
BCH-MC-002.2	1	2	1	-	-	2	3	2	1	-	-	1	-	-	-

MANAV RACHNA INTERNATIONAL INSTITUTES OF RESEARCH AND STUDIES
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NAAC 'A++' Grade University
CDC-PC-102: Professional Communication - II

Periods/week Credits Max. Marks : 100
L: 2 T: 0 2 Continuous Evaluation: 50
Duration of Examination: 1.5 Hrs End Semester Examination: 50

Student Outcomes: Students will be able to
CDC-PC-102.1: exhibit effective reading and writing skills in a professionally stimulated environment.
CDC-PC-102.2: enhance skills to effectively deliver formal and informal presentations to a variety of audiences in multiple contexts.
CDC-PC-102.3: learn grammatically correct formal writing skills.

Unit 1: **Developing Communication Skills- II (Reading & Writing)**
1.1 Reading Comprehension
1.2 Writing Skills: Specific to AMCAT. Introduction to Writing: Organizing Principles of Paragraph, Precise Writing, Punctuations
1.3 Report Writing
1.4 Note Taking

Unit 2**: Syntactical English II**
2.1 Indianism & Localism
2.2 Conditionals
2.3 Preposition of Time & Place

Unit 3**: Effective Communication**
3.1 Concepts of Chronemics: Interpretation of time with business environment
3.2 Monochromic vs. Polychromic Cultures
3.3 Non- Verbal Communication: Kinesics & Proxemics
3.4 Acing virtual (video) interviews

Unit 4**: Presentation Skills**
4.1 Opening & closing of Presentations
4.2 Audience Analysis

4.3 Structuring the Presentation
4.4 Best Practice in Presentations

Continuous EvaluationDistribution:-

Sessional (Average of Sessional I & Sessional II)	30 marks
Assignment	10 marks
Class performance	5 marks
Attendance	5 marks

Course Articulation Matrix

CO Statement (CDC-PC-102)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	O10	O11	O12	PSO 1	PSO 2	PSO 3
CDC-PC-102 .1	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-
CDC-PC-102 .2	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CDC-PC-102 .3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-