Study & Evaluation Scheme

of

Bachelor of Science (Hons.) (Mathematics)

[Applicable for Academic Session 2019-20]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

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TEERTHANKER MAHAVEER UNIVERSITY
(Established under Govt. of U.P. Act No. 30, 2008)
Delhi Road, Bagarpur, Moradabad (U.P.)

Study & Evaluation Scheme	
SUMMARY	
Institute Name	*Faculty of Engineering*
Programme	*B.Sc(H) Mathematics*
Duration	*Three Years full time(Six Semesters)*
Medium	*English*
Minimum Required Attendance	*75%*
Credits	
Maximum Credits	*162*
Minimum Credits Required for Degree	*156*

Assessment:					
Evaluation			**Internal**	**External**	**Total**
Theory			40	60	100
Practical/ Dissertations/ Project Reports/ Viva-Voce			50	50	100
Class Test-1	**Class Test-2**	**Class Test-3**	**Assignment(s)**	**Attendance & Participation**	**Total**
Best two out of three					
10	10	10	10	10	40
Duration of Examination			**External**	**Internal**	
			3 Hours	1.5 Hours	

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teachers continuous evaluation.(i.e. both internal and external). A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.

 # Provision for delivery of 25% content through online mode.

 # Policy regarding promoting the students from semester to semester & year to year. No specific condition to earn the credit for promoting the students from one semester to next semester.

 # Maximum no of years required to complete the program: N+2 (N=No of years for program)

Question Paper Structure	
1	*The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.*
2	*Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.*
3	*The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.*
IMPORTANT NOTES:	
1	*The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).*
2	*Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*
3	*There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.*

Program Structure-B.Sc. (H) Mathematics

A. Introduction:

B.Sc. (H) Mathematics is an undergraduate degree program. Mathematics is the branch of structure, space, quantity, and change. This course provides in-depth knowledge about trigonometry, geometry, calculus and numerous other theories in Mathematics or respective disciplines, for example, computer science or statistics additionally to study of the normal Bachelor of Science subjects such as Physics and Chemistry. The duration of the course is three years and the syllabus for the course is divided into six semesters. This Honours course is an important and valuable one that provides opportunities to the candidates of taking some of the subjects of a Master's degree. After completing the course, they can go to many fields to obtain jobs.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University.

The following is the course module designed for the B.Sc (H) program:

- ***Core competency:*** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. We are offered core course in all semesters like operation research, Trigonometry & Differential Calculus, Algebra & matrix, Differential Calculus & Integral calculus etc with the 5 & 6 credit of each.

- ***Program/Discipline Specific Elective Course (DSEC):*** A graduate student is expected to be capable of demonstrating comprehensive knowledge and understanding of both theoretical and experimental/applied mathematics knowledge in various fields of interest like Statistics Software & Tools, Numerical Techniques & its lab etc.

- ***Skilled communicator:*** The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

- ***Critical thinker and problem solver:*** The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic & advance knowledge and concepts of mathematics.

- ***Sense of inquiry:*** It is expected that the course curriculum will develop an inquisitive characteristics among the students through appropriate questions, planning and reporting experimental investigation.

- ***Skilled project manager:*** The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about mathematical project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

- ***Ethical awareness/reasoning:*** A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

- ***Lifelong learner:*** The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

- ***Value Added Course (VAC):*** A Value Added Course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester I, II, III & IV semesters and two courses of Soft Skills in III & IV Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

- ***Skill Enhancement Course:*** This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. We offer two SECs course as Lab & theory- one in III Semester & another is IV Semester. SEC will carry 2 & 4 credits each.

- ***Open Elective Course (OEC):*** Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in V semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

- ***Mandatory Course (MC):*** This is a compulsory course that does not have any choice and will be of 3 credits. Each student of B.Sc (H). Program has to compulsorily pass the Environmental Studies.

C. Programme Outcomes (POs)

The learning and abilities or skills that a student would have developed by the end of three-years B.Sc (H) Programs**:**

PO – 1	**Critical thinking** - This is based on the assumption, thinking and actions. These assumptions are tested for accuracy & validity taking into consideration the ideas and decisions. These ideas may be collected from intellectual organization or personal from different prospectus.
PO – 2	**Effective communication-** Effective communication an important tool to enhance the effectiveness of learning among the students. The speaking, reading & writing must be followed correctly.
PO – 3	**Social interaction –**Social interaction also play important role to reads the conclusion in group settings.
PO – 4	**Effective citizenship**- This contributes in the national development and promptness to achieve the goals. It develops awareness through volunteering.
PO – 5	**Ethics-** It has direct impact to recognize the different value systems. It gives proper understanding in different dimension for making decisions.
PO – 6	**Environment and sustainability**- Essential to understand the environmental issues & sustainable development.
PO – 7	**Self directed & lifelong learning –** Acquire the ability to engage in independent and life- long learning in broad spectrum including socio technological changes.
PO- 8	**Problem analysis & Solving:** Identify, formulate, research literature, and analyze complex basic sciences problems reaching substantiated conclusions using first principles of mathematics, natural sciences.

PO- 9	**Entrepreneurship:** An Entrepreneurship cut across every sector of human life including the field of engineering, engineering entrepreneurship is the process of harnessing the business opportunities in engineering and turning it into profitable commercially viable innovation.
PO- 10	**Interpersonal skills:** Interpersonal skills involve the ability to communicate and build relationships with others. Effective interpersonal skills can help the students during the job interview process and can have a positive impact on your career advancement.
PO- 11	**Technology savvy/usage:** Being technology savvy is essentially one's skill to be smart with technology. This skill reaches far beyond 'understanding' the concepts of how technology works and encompasses the 'utilization' of such modern technology for the purpose of enhancing productivity and efficiency.

D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developed by the end of three-years B.Sc (H) Mathematics**:**

PSO – 1	**Understanding** the value and importance of critical manner.
PSO – 2	**Understanding** in the advance areas of mathematics and statistics of their respective chosen area.
PSO – 3	**Applying the** techniques & mathematical models on the need of requirement and analyzing the available information for solving various Problems.
PSO – 4	**Analyzing** and developing mathematical arguments or models in a logical manner.
PSO – 5	**Evaluating** quantitative models arising in social science, business and other contexts.
PSO – 6	**Creating** and applying appropriate techniques, resources and modern technology in multidisciplinary environment.

E. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will **emphasize on experiential learning:**

- ***Role Play & Simulation:*** Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

- ***Video Based Learning (VBL) & Learning through Movies (LTM):*** These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students

learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

- ***Field/Live Projects*:** The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.
- ***Industrial Visits:*** Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

- ***MOOCs:*** Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs.
  University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.
  Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.
  For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

  a) This is recommended for every student to take at least one MOOC Course throughout the programme.
  b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
  c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.
  d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.
  e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.
  f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.
  g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

- ***Special Guest Lectures (SGL) &Extra Mural Lectures (EML):*** Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

- ***Student Development Programs (SDP):*** Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

- ***Industry Focused programes:*** Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice based insight to the students.

- ***Special assistance programe for slow learners & fast learners:*** write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners.

- ***Induction program:*** Every year 3 weeks induction program is organized for 1st year students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

- **Mentoring scheme:** There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

- **Extra-curricular Activities:** organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

- **Career & Personal Counseling:** - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change.
  Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.
  Strategies: a) Once in a week the counselors meet the students in order to inquire about problems.
  b) Available 24x7 on SOS basis.

- **Participation in Workshops, Seminars & writing & Presenting Papers:** Departments plan to organize the workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. These participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non credit course.

- **Formation of Student Clubs, Membership & Organizing & Participating events:** Every department has the departmental clubs with the specific club name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

- **Capability Enhancement & Development Schemes:** The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

- **Library Visit & Utilization of E-Learning Resources:** Student can visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.
  - **a)** Institute Library & Information is subscribing online e-books and e-journals databases (DELNET and EBSCO host E-databases) as per the requirement of the institute and fulfilling AICTE norms. IP based access is given to all computers connected on campus LAN to access e-journals.
  - **b)** For the effective utilization of resources, Information Literacy training programs are conducted to the staff and students.
  - **c)** Wi-Fi enabled campus
  - **d)** Regular addition of latest books and journals
  - **e)** Well maintained e-library to access e-resources

Study & Evaluation Scheme

Semester I

S. No.	*Category*	*Subject Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	AECC	BAS115	General Chemistry-I	4	-	-	4	40	60	100
2	CC	BAS116	Algebra & Matrices	4	1	-	5	40	60	100
3	CC	BAS117	Trigonometry & Differential Calculus	4	1	-	5	40	60	100
4	AECC	BCS111	Computer System & Programming in C++	3	-	-	3	40	60	100
5	AECC	TMUGE101	English Communication -I	2	-	2	3	40	60	100
6	AEC	BAS167	General Chemistry-I (Lab)	-	-	4	2	50	50	100
7	AEC	BCS161	Computer System & Programming in C++ (Lab)	-	-	2	1	50	50	100
		Total		**17**	**2**	**8**	**23**	**300**	**400**	**700**

Value Added Course:
It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAC-1	TMUGA-101	Foundation in Quantitative Aptitude	2	1	-	-	40	60	100

Semester II

S. No.	*Category*	*Subject Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	AECC	BAS215	General Chemistry- II	4	-	-	4	40	60	100
2	CC	BAS216	Vector calculus & Geometry	4	-	-	4	40	60	100
3	CC	BAS217	Integral Calculus	4	-	-	4	40	60	100
4	AECC	BAS213/ BAS114	Mechanics	4	-	-	4	40	60	100
5	AECC	TMU201	Environmental Studies	2	1	-	3	40	60	100
6	AECC	TMUGE201	English Communication-II	2	-	2	3	40	60	100
7	AEC	BAS262	General Chemistry- II (Lab)	-	-	4	2	50	50	100
8	AEC	BAS267/ BAS166	Mechanics (Lab)	-	-	4	2	50	50	100
		Total		**20**	**1**	**10**	**26**	**340**	**460**	**800**

***Value Added Course:**

1	VAC-2	TMUGA-201	Analytical Reasoning	2	1	-	-	40	60	100

B.Sc. (H) (Mathematics)-Semester III

S. No	*Category*	*Course Code*	Course	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	CC	BAS315	Partial Differential Equation	4	1	-	5	40	60	100
2	CC	BAS316	Modern Algebra	4	1	-	5	40	60	100
3	CC	BAS319	Numerical Analysis	5	1	-	6	40	60	100
4	AECC	TMUGE301	English Communication-III	2	-	2	3	40	60	100
5	AECC	BHM315	Human values & Professional Ethics	3	-	-	3	40	60	100
6	GEC		Generic Elective Course: Generic Elective-V	3	1	-	4	40	60	100
7	SEC		Skill Enhancement Course: Skill Enhancement Course –I	-	1	2	2	50	50	100
8	DGP	BGP311	Discipline & General Proficiency	**-**	**-**	**-**	**-**	100	-	100
			Total	**21**	**5**	**4**	**28**	**290**	**410**	**700**

***Value Added Course:**

1	VAC-3	TMUGA-302	Modern Algebra and Data Management	2	1	-	-	40	60	100
2	VAC-4	TMUGS-301	Managing Self	2	1	-	-	50	50	100

B.Sc. (H) (Mathematics)-Semester IV

S. No	*Category*	*Course Code*	Course	*Periods*			*Credit*	*Evaluation Scheme*		
				L	*T*	*P*		*Internal*	*External*	*Total*
1	CC	BAS415	Ordinary Differential Equation	4	1	-	5	40	60	100
2	CC	BAS416	Real Analysis	4	1	-	5	40	60	100
3	CC	BAS432	Operations Research	5	1	-	6	40	60	100
4	AECC	TMUGE401	English Communication-IV	2	-	2	3	40	60	100
5	AECC	BHM415	Entrepreneurship	3	-	-	3	40	60	100
6	SEC		Skill Enhancement Course / Skill Enhancement Course –II	3	1	-	4	40	60	100
7	DGP	BGP411	Discipline & General Proficiency	**-**	**-**	**-**	**-**	100	-	100
			Total	**21**	**3**	**2**	**26**	**240**	**360**	**600**

***Value Added Course:**

1	VAC-5	TMUGA-402	Advance Algebra and Geometry	2	1	-	-	40	60	100
2	VAC-6	TMUGS-401	Managing Work and Others	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-1	MOOC12	MOOC Program –I (Optional)	-	-	-	2	-	100	100

B.Sc. (H) (Mathematics)-Semester V

S. No	*Category*	*Course Code*	**Course**		*Periods*			*Credit*	*Evaluation Scheme*		
					L	*T*	*P*		*Internal*	*External*	*Total*
1	CC	BAS517	Applied Statistics		5	1	-	6	40	60	100
2	CC	BAS518	Complex Analysis		5	1	-	6	40	60	100
3	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-I	5	1	-	6	40	60	100
4	DSE			Discipline Specific Elective Course-II	5	1	-	6	40	60	100
5	OEC		Open Elective Course	Open Elective-I	3	-	-	3	40/50	60/50	100
6	PROJ	BAS598	Industrial Training & Presentation		-	-	6	3	50	50	100
7	DGP	BGP511	Discipline & General Proficiency		**-**	**-**	**-**	**-**	100	-	100
			Total		**23**	**4**	**6**	**30**	**250/260**	**350/340**	**600**

MOOC Course:

1	MOOC-2	MOOC13	MOOC Program –II (Optional)	-	-	-	2	-	100	100

B.Sc. (H) (Mathematics)-Semester VI

S. No	*Category*	*Course Code*	**Course**		*Periods*			*Credit*	*Evaluation Scheme*		
					L	*T*	*P*		*Internal*	*External*	*Total*
1	CC	BAS619	Graph Theory		5	1	-	6	40	60	100
2	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-III	5	1	-	6	40	60	100
3	DSE			Discipline Specific Elective Course-IV	5	1	-	6	40	60	100
4	OEC		Open Elective Course	Open Elective-II	3	-	-	3	40/50	60/50	100
5	PROJ	BAS698	Project		-	-	16	8	50	50	100
6	DGP	BGP611	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**18**	**3**	**16**	**29**	**210/220**	**290/280**	**500**

ELECTIVE COURSES OFFERED

S. No	Code	Course	L	T	P	Credit
Semester III- Generic Elective V-(Any one)						
1	BAS314	Elements of Modern Physics	3	1	0	4
2	BCS311	Database Management System	3	1	0	4
Semester III- Skill Enhancement Course –I						
3	BAS367	Introduction to MATLAB	-	1	2	2
Semester IV- Skill Enhancement Course –II -(Any one)						
4	BAS426	Introduction to Statistical Package for Social Sciences	3	1	0	4
5	BAS431	Statistical Methods	3	1	0	4
Semester V- Discipline Specific Elective Course-I -(Any one)						
6	BAS531	Metric Space	5	1	0	6
7	BAS532	Integral Transform	5	1	0	6
8	BAS533	Discrete Mathematics	5	1	0	6
Semester V- Discipline Specific Elective Course-II -(Any one)						
9	BAS535	Dynamics	5	1	0	6
10	BAS536	Special Functions	5	1	0	6
Semester VI- Discipline Specific Elective Course-III -(Any one)						
11	BAS616	Fourier & Laplace Transform	5	1	0	6
12	BAS633	Differential Geometry and Tensor	5	1	0	6
13	BAS632	Theory of Probability	5	1	0	6
Semester VI- Discipline Specific Elective Course-IV -(Any one)						
14	BAS631	Mathematical Modeling	5	1	0	6
15	BAS634	Number Theory	5	1	0	6

Semester-I
General Chemistry-I

Course Code: BAS115

L	T	P	C
4	0	0	4

Course outcomes:

On completion of the course the participants will be:

CO1: Remembering & understanding the concepts of atomic structure, periodic properties of elements

CO2: Remembering & understanding the concepts of Chemical bonding.

CO3: Understanding the concepts of organic chemistry & various types of organic reaction & their mechanism

CO4: Applying chemical bonding in explaining the bonding characteristics of molecules.

Course Contents:

Unit I **(08 Lectures)**

Atomic Structure:

Schrödinger's wave equation, significance of ψ and ψ^2. Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of *s*, *p*, *d* and *f* orbitals.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations.

Unit II **(08 Lectures)**

Periodicity of Elements:

Effective nuclear charge, shielding or screening effect, Atomic & ionic radii, Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy, Electron gain enthalpy, Electronegativity,trends in periodic table and applications in predicting and explaining the chemical behaviour.

Unit III **(08 Lectures)**

Chemical Bonding:

Covalent bond: Valence Bond theory & its limitations. Hybridization & shapes of simple inorganic molecules & ions, Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, Resonance and resonance energy, Molecular orbital theory & MO diagrams of Homo & heteronuclear (CO, NO) diatomic molecules.

Unit IV **(08 Lectures)**

Basics of Organic Chemistry I:

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties.

Electronic Displacements: Inductive, electrometric, resonance and mesmeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength.

Unit V **(08 Lectures)**

Basics of Organic Chemistry II:

Homolytic and Heterolytic fission. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions with examples.

Text &Reference Books:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson.
3. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry, Oxford University Press.
4. Castellan, G. W. Physical Chemistry, Narosa.
5. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.

*** Latest editions of all the suggested books are recommended.**

Semester I
General Chemistry-I (Lab)

Course Code: BAS167 **L T P C**
0 0 4 2

Course outcomes:

On completion of the course the participants will be:

CO-1 Detection of extra elements (N, S, Cl, Br, I) in the given organic compounds by Lassaigne test.

CO-2 Identification of functional group in the given organic compounds.

CO-3 Estimation of Fe (II) and Cu (II) in the given sample of water by Oxidation-Reduction Titrimetric.

CO-4 Estimation of total hardness of a given sample of water by complexometric titration.

CO-5 Preparation of Potash alum and Chrome Alum.

List of Experiments:

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)
2. Systematic Qualitative Organic Analysis of Organic Compounds possessing mono functional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.
3. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.
4. Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$.
5. Estimation of oxalic acid by titrating it with $KMnO_4$.
6. Estimation of total hardness of a given sample of water by complexometric titration.
7. Preparation of Potash alum.
8. Preparation of Chrome Alum.

Text & Reference Books:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall.
4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester-I
Algebra & Matrices

Course Code: BAS116

L	T	P	C
4	1	0	5

Course Outcomes:

On completion of the course the participants will be:

CO1: Understanding the connection between linear equation and its matrix representation.

CO2: Understanding and analyzing basic algebraic equations.

CO3: Understanding the concepts of inverse, Eigen values and their corresponding Eigen vectors.

CO 4: Interpreting of the mathematical statements & its results.

CO 5: Analyzing the system of linear equations, consistency & dependency.

Course Contents:

Unit I (Lectures 08)

Matrices and determinants, Elementary row and column transformation, Linear transformations, Rank of matrix.

Unit II (Lectures 08)

Consistency of linear system of equations, Linear dependence and independence, Hermitian and skew Hermitian matrices, general form of matrices.

Unit III (Lectures 08)

Inverse of matrix by elementary operations, Solutions of simultaneous equations, Characteristic equation, Caley-Hamilton theorem (without proof), Eigen values and eigen vectors, Diagonalization.

Unit IV (Lectures 08)

Sets, Relations, Functions, Binary operations, Permutation, Groups and subgroup its elementary properties.

Unit V (Lectures 08)

Isomorphism and Homomorphism of Groups, Caley's theorem, Order of an element, Rings, Fields and integral domains.

Text Books:

1. "Matrices" by Dr. J.K.Goel and K.P.Gupta, Students Friends & Co.

2. "Modern Algebra" by A. R. Vashisth, KrishanaPrakshan Mandir.

Reference Books:

1. "Matrices" by Shanti Narain, S Chand &Co.

2. "Matrices" by N. Saran and J. K. Goyal, Pragati Prakashan

3. "Modern algebra" by I N Herstein, Wiley Eastern Ltd.

4. "Modern algebra" by Surjeet Singh and Qazi Zameesuddin, Vikash Publishing House Pvt Ltd.

5. "Modern algebra" by D. C. Agarwal and H. N Nigam, Shiksha Sahitya Prakshan

6. "Modern algebra" by Harsh Swaroop Sharma and H. S. Seth, Ram Prashad& Sons

7. "Elements of Matrices" by Dr. M. Ray and S.S. Sethi Ram Prasad &Sons.

8. "Matrices" by A.R. Vashistha, Krishna Prakashan Mandir.

*** Latest editions of all the suggested books are recommended.**

Semester-I
Trigonometry & Differential Calculus

Course Code: BAS117

L	T	P	C
4	1	0	5

Course Outcomes:

On completion of the course the participants will be:

CO:1 Understanding the concept of Successive differentiation, derivatives of functions of variables.

CO:2 Understanding the concepts of partial differentiation & exponential functions.

CO:3 Applying the concept of Leibnitz's theorem for successive derivatives.

CO:4 Evaluating the double integration and triple integration using Cartesian & polar co-ordinates & the concepts of Jacobian of transformation.

Course Contents:

Unit I **(Lectures 08)**

Circular and hyperbolic functions of complex quantities, Separation of real and imaginary parts of trigonometric, logarithmic, and exponential functions.

Unit II **(Lectures 08)**

Gregory's series, summation of series, Expansion of Functions.

Unit III **(Lectures 08)**

Successive differentiation, Leibnitz theorem (without proof), Euler's theorem, Mean value theorems, tangent and normal, maxima and minima, limit and its properties.

Unit IV **(Lectures 08)**

Mac Laurin's and Taylor's expansion of functions, errors and approximation, Asymptotes and curvature of curves in Cartesian and polar coordinates, Partial differentiation.

Unit V **(Lectures 08)**

Tracing of curves in Cartesian, parametric and polar coordinates (conics, asteroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardioids, Lemniscates, equiangular spiral), Jacobian, Indeterminate forms, Envelop and Evolutes.

Text Books:

1. "Differential Calculas" by Gorakh Prasad, Pothishala Pvt Ltd.

2. "Trigonometry" by A. K. Saxena, Aeykay Prakashan, Bareilly

Reference Books:

1. "Trigonometry" by A.R. Vashistha and R. K. Gupta, Krishna Prakashan Mandir.

2. "Differential Calculus" by N. Pishkunor, Peace Publishers Moscow

3. "Differential Calculus" by Khalil Ahmed, Anamya Publication, New Delhi

*** Latest editions of all the suggested books are recommended.**

Semester I
Computer System & Programming in C++

Course Code: BCS111 **L T P C**
3 0 0 3

Course Outcomes:
On completion of the course the students will be:
CO1: Understanding the concept of various components of computer system.
CO2: Understanding the Object-Oriented Programming Language concepts.
CO3: Analyzing basic mathematical problem and their solutions through programming
CO4: Applying knowledge to prepare programming solutions for distinct problems.
CO5: Applying knowledge to prepare scalable solutions through function.

Course Contents:

Unit I **(Lectures 08)**

Problem Solving: Phases of problem solving, Algorithms, Structure Chart, Flow chart, Practice of solving Sequence Problems, Selection Problems, Repetition problem.
Statements for problem solving: if, switch, while, for, do, break, continue, go to statements.

Unit II **(Lectures 08)**

Concepts in Computer Application: Generations, Characteristic and Application of Computers, Functional Component of Computer: CPU, I/O devices, Type of Memory. Translators: Assembler, Compiler, and Interpreter; Number System: Decimal, Octal, Binary and Hexadecimal &their Conversions; Various Codes: BCD, ASCII and EBCDIC and Gray Code.

Unit III **(Lectures 08)**

Concepts in Operating System: Purpose, Services, Types, Functions.
Data Communication & Networks: Types, Topology, IP address classes.
C++ Basics: Data types, Variables, Constants, Keywords, Identifiers, Types of Operators, Memory Allocation operators, Expressions, Pre-processor directives, Introduction to Array, Pointers, Structures and Strings.

Unit IV **(Lectures 08)**

Functions: Scope of variables; Parameter passing; Default arguments; Inline functions; Recursive functions; Pointers to functions.
C++ Classes and Data Abstraction: Class Structure, Objects; this pointer; Friend function; Static class members; Constructors and Destructors; Data abstraction.
Inheritance: Types, Access to the base class members; Virtual base class.

Unit V **(Lectures 08)**

Polymorphism: Function overloading; Operator overloading; Static Binding and Dynamic bindings; Virtual function: Definition, Call mechanism, Pure virtual functions; Virtual destructors; Abstract Classes.
C++ I/O: Stream classes hierarchy; Stream I/O; File streams; Overloading << and >> operators; File Modes, Reading and Writing to a file; Formatted I/O.

Text Books-

1. Bjarne Stroutrup, The C++ Programming Languge, Adison Wesley.
2. Object-Oriented Programming with C++, Balagurusamy, TMH
3. C++ The Complete Reference, Schildt, TMH
4. Programming in C++, Shah &Thaker, ISTE/EXCEL

Reference Books-

1. Beginning C++, The Complete Language, Horton,SPD/WROX
2. Programming with C++, Radhaganesan, Scitech
3. Projects using C++, Varalaxmi, Scitech
4. Object Oriented modelling & Design, RumBaugh, PHI

***Latest editions of all the suggested books are recommended.**

Semester I
Computer System & Programming in C++ (Lab)

Course Code: BCS161

L	T	P	C
0	0	2	1

Course Outcomes:
On completion of the course the students will be:
CO1: Analyzing basic mathematical problem and their solutions through programming.
CO2: Applying knowledge to prepare programming solutions for specific problems.
CO3: Applying knowledge to prepare scalable solutions through functions.

List of Experiments:
Note: Minimum 15 experiments should be performed from the following:

1. Write a Program (WAP) to calculate Sum & average of N numbers.
2. WAP to convert integer arithmetic to a given number of day and month.
3. WAP to find maximum and minimum out of 3 numbers a, b & c.
4. WAP to find factorial of positive integer.
5. WAP to find sum of series up to n number, 2+5+8+……+n.
6. WAP to print all the number between 1 to 100 which are dividing by 7.
7. WAP to generate Fibonacci series up to n.
8. WAP to calculate area of circle using Functions.
9. WAP to calculate factorial of given number using Recursion function.
10. WAP to find whether number is prime or not.
11. WAP to find that the enter character is a letter or digit.
12. WAP to find addition of two matrix of n*n order.
13. WAP to find multiplication of two matrix of n*n order.
14. WAP to find even or odd up to a given limit n.
15. WAP to find whether a given no is palindrome or not.
16. WAP to Swap two numbers using third Variable and without using third variable.
17. WAP to Swap two numbers using call by value and call by reference.
18. WAP illustrating overloading of various operators.
19. WAP illustrating use of Friend.
20. WAP illustrating use of Inline Function.
21. WAP illustrating use of destructor and various types of constructor.
22. WAP illustrating various forms of Inheritance.

23. WAP illustrating use of virtual functions, virtual Base Class.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester I
English Communication – I

Course Code: TMUGE101 **L T P C**
2 0 2 3

Course Outcomes:
On completion of the course the participants will be:

CO1. Remembering and understanding of the basic of English grammar and vocabulary.

CO2. Understanding of the basic Communication process.

CO3. Applying correct vocabulary and tenses in sentences construction.

CO4. Analyzing communication needs and developing communication strategies using both verbal & non-verbal method.

CO5. Drafting applications in correct format for common issues.

CO6. Developing self-confidence.

Course Contents:

Unit – I Introductory Sessions **(06 hours)**

- Self-Introduction
- Building Self Confidence: Identifying strengths and weakness, reasons Failure, strategies to overcome Fear of Failure
- Importance of English Language in present scenario

(Practice: Self-introduction session)

Unit – II Basics of Grammar **(12 hours)**

- Parts of Speech
- Tense
- Subject and Predicate
- Vocabulary: Synonym and Antonym

(Practice: Conversation Practice)

Unit – III Basics of Communication **(10 hours)**

- Communication: Process, Types, 7Cs of Communication, Importance & Barrier
- Language as a tool of communication
- Non-verbal communication: Body Language
- Etiquette & Manners
- Basic Problem Sounds

(Practice: Pronunciation drill and building positive body language)

Unit – IV Application writing **(08 hours)**

- Format & Style of Application Writing
- Practice of Application writing on common issues.

Unit - V Value based text reading: Short Story (Non- detailed study) **(04 hours)**

- Gift of Magi - O. Henry

Text Books:

1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.

Reference Books:

- Kumar, Sanjay. & Pushp Lata. "Communication Skills" New Delhi: Oxford University Press.
- Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster.
- Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row.
- Goleman, Daniel. "Emotional Intelligence' Bantam Book.

Methodology:

1. Language Lab software.
2. The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.
3. Conversational Practice will be effectively carried out by Face to Face & Via Media (Telephone, Audio-Video Clips)
4. Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized.

Note:

- Class (above 30 students) will be divided in to two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		**100**
20 Marks (Best 2 out of Three CTs) ***(From Unit- II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit -1 & III)***	

*Parameters of External Viva

Content	**Body Language**	**Confidence**	**Question Responsiveness**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: TMUGA-101	Value Added Course BSC- Semester-I **Foundation in Quantitative Aptitude**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Solving complex problems using criss cross method, base method and square techniques.	
CO2.	Applying the arithmetical concepts of Average, Mixture and Allegation.	
CO3.	Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction.	
CO4.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
Course Content:		
Unit-1:	**Speed calculations** Squares till 1000,square root, multiplications: base 100, 200 300 etc., 11-19, crisscross method for 2X2, 3X3, 4X4, 2X3, 2X4 etc., cubes, cube root	**2 Hours**
Unit-2:	**Percentages** Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	**5 Hours**
Unit-3:	**Profit Loss Discount** Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	**5 Hours**
Unit-4:	**SI and CI** Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments	**2 Hours**
Unit-5:	**Averages** Basic Averages, Concept of Distribution, Weighted Average, equations	**2 Hours**
Unit-6:	**Mixtures and allegations** Mixtures of 2 components, mixtures of 3 components, Replacements	**4 Hours**
Unit-7:	**Number and alphabet series** Number series, alphabet series	**2 Hours**
Unit-8:	**Blood relations** Indicating type, operator type, family tree type	**2 Hours**
Unit-9:	**Ranking** Linear ranking, complex ranking	**1 Hours**
Unit-10:	**Direction sense** Simple statements, shadow type	**1 Hours**
Unit-11:	**Cubes and dices** Concept of cubes, rotation type, Dices, regular dices, irregular dices	**4 Hours**
Text Book:	• Quantitative Aptitude by R.S. Agrawal	

Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Semester II
General Chemistry-II

Course Code: BAS215 **L T P C**
4 0 0 4

Course Contents:

Unit – I **(8 Lectures)**

Gaseous state: Postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path, including their temperature and pressure dependence. Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, Causes of deviation from ideal behaviour. Van der Waals equation of state, its derivation and application in explaining real gas behaviour, virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature.

Unit – II **(8 Lectures)**

Liquid state: Qualitative treatment of the structure of the liquid state; Radial distribution function; physical properties of liquids; vapor pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

Unit – III **(8 Lectures)**

Solid state: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; Bragg's law, Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals.

Unit – IV **(8 Lectures)**

Ionic equilibria I: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment).

Unit – V **(8 Lectures)**

Ionic equilibria II:

Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers

Solubility and solubility product of sparingly soluble salts – applications of solubility product principle

Theory of acid–base indicators; selection of indicators and their limitations.

Text &Reference Books:

1. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry., Oxford University Press.
2. Castellan, G. W. Physical Chemistry, Narosa.
3. Mortimer, R. G. Physical Chemistry, Elsevier: NOIDA, UP.
4. Engel, T. & Reid, P. Physical Chemistry, Pearson.

*** Latest editions of all the suggested books are recommended**

Semester-II
Vector Calculus& Geometry

Course Code: BAS216

L	T	P	C
4	0	0	4

Course Outcomes:

CO 1:To Develop &Practicing critical and reflective thinking abilities.

CO 2:To demonstrate an understanding of group dynamics and effective.

CO 3:The Students who successfully complete this course should be able to identify and explain the necessary concepts of Vector calculus & 3D-Solid Geometry.

CO 4:To learn the different methods of tools of Solid Geometry which are very useful for further studies.

CO 5:Students who successfully complete this course should be able to explain and apply appropriate analytical concepts to various topics of 3D-Solid Geometry.

Course Contents:

Unit I **(Lectures 08)**

Scalar and vector product, multiple product of vectors, simple geometrical application of plane straight line and spheres.

Unit II **(Lectures 08)**

Differentiation and Integration of vectors, gradient divergence and curl operators, Gauss divergence theorem, Stoke and Green's theorem (without proof), simple applications.

Unit III **(Lectures 08)**

2-dimensional coordinate geometry, Tracing of conics, Polar equations of conics.

Unit IV **(Lectures 08)**

(3- dimensional coordinate geometry). System of coordinates in three dimensions, Straight lines in symmetrical and non-symmetrical forms, coplanar lines, Shortest distance between two skew lines, Equation of plane in different forms, Intersection of three planes, Volume of tetrahedron.

Unit V **(Lectures 08)**

Equation of Sphere, tangent plane, Radical plane, Equation of cylinder, enveloping cylinder, rigid circular cylinder, tangent plane with given vertex and given conic, enveloping, rigid circular cone, tang ent planes.

Text Books:

1. "Co-ordinate Geometry of 2D" by P.K. Jain and Khalid Ahemad, Wiley Eastern Co.
2. "Analytic Solid Geometry" by A.R Vashisth and S. C. Agarwal, KrishanaPrakahan Mandir
3. "Vector Analysis" by H. S. Sharma and G. C. Sharma, Students Friends & Co.

Reference Books:

1. "Co-ordinate Geometry of 2D" by S. L. Loney, Maemillan and Co.
2. "Co-ordinate Geometry of 2D" by S. C. Gupta, B. M. L. Tiwari and P.C. Jain, Pragati Prakashan.
3. "Co-ordinate Geometry of 2D" by N. Saran and R. S. Gupta, Pothishala Pvt Ltd.
4. "Co-ordinate Geometry of 2D" by A. K. Saxena, Aeykay Publication Bareilly
5. "Co-ordinate 3D Geometry" by R. J. T Bell, Maemillan& Co.
6. "Co-ordinate 3D Geometry" by Gorakh Prasad and H. C. Gupta, Pothishala Pvt Ltd.
7. "Co-ordinate Geometry of 3D" by S. C. Mittal and S. K. Mittal, Pragati Prakashan.
8. "Co-ordinate Geometry of 3D" by P. K. Jain and Khalid Ahemad, New Age International New Delhi
9. "Vector Analysis" by M. R. Speegel, Schaum Publishing Co. New Delhi.
10. "Vector Analysis" by Shanti narayan, S Chand & Co
11. "Vector Analysis" by N. Saran and S. N. Nigam, Pothishala Pvt Ltd

*** Latest editions of all the suggested books are recommended.**

Semester-II
Integral Calculus

Course Code: BAS217 **L T P C**
4 0 0 4

Course Outcomes:

CO 1: They can find various aspects of curves and solids (length area volume)
CO 2:They can apply these fundamental concepts and working knowledge to other courses.
CO 3: Develops the concepts of limit and sum of limit, anti derivative.
CO 4: They can formulate and solve ordinary differential equations .
CO 5: they will understand special functions (Beta And Gama)

Course Contents:

Unit I **(Lectures 08)**

Definite integration (Miscellaneous Examples), integration as the limit of sum, Reduction Formula.

Unit II **(Lectures 08)**

Multiple integration, Beta and gamma functions and applications, length of curves, Areas bounded by the curves.

Unit III **(Lectures 08)**

Drichlet's integral, Volume and surfaces of revolutions

Unit IV **(Lectures 08**

Differential equation of first order and first degree, Differential equation of first order but not of first degree. Miscellaneous differential equations.

Unit V **(Lectures 08)**

Linear differential equation of second order with constant coefficient, Linear differential equation of other types.

Text Books:

1. "Integral Calculus" by Gorakh Prasad, PothishalaPvt. Ltd.
2. "Integral Calculus"by M. Ray, Shiv Lal Agarwal & Co Agra.
3. "Integral Calculus"byP. V. Pishkuno, Peace Publishers Mascow.

Reference Books:

1. "Integral Calculus" by Shanti Narayan and P.K Mittal, S.Chand& Company Ltd
2. "Integral Calculus" by Brahmanand, B. S. Tyagi, and B. D. Sharma, Kedarnath Ram Nath.
3. "Integral Calculus by" Shani Narayan, S.Chand& Company Ltd

*** Latest editions of all the suggested books are recommended.**

Semester-II
Mechanics

Course Code: BAS213/BAS114

L	T	P	C
4	0	0	4

Course Outcomes: The student will be able:

CO 1 To compute basic quantities in linear and rotational mechanics
CO 2 To formulate, analyze and solve a multi-level problem in mechanics.
CO 3 To apply mathematical tools to mechanics

Course Contents:

Unit – I **(Lectures 08)**

Rotational Dynamics: Centre of Mass and Laboratory frames. Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation, Motion involving both translation and rotation.

Unit – II **(Lectures 08)**

Fluid Motion: Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.

Gravitation and Central Force Motion: Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere.

Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Centrifugal force. Coriolis force.

Unit – III **(Lectures 08)**

Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire.

Central Forces: Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Unit – IV **(Lectures 08)**

Oscillations: SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor.

Unit – V **(Lectures 08)**

Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Massless Particles. Lorentz Transformations: Simultaneity, Length contraction, Time dilation, Twin Paradox, Relativistic addition of velocities, Variation of mass with velocity. Mass energy Equivalence.

Text & Reference Books:

1. An introduction to mechanics, D. Kleppner, R. J. Kolenkow, McGraw-Hill.

2. Mechanics, Berkeley Physics, C.Kittel, W.Knight, Tata McGraw-Hill. Physics, Resnick, Halliday and Walker, Wiley.

3. Analytical Mechanics, G.R. Fowles and G.L. Cassiday, Cengage Learning.

4. Feynman Lectures, Vol. I, R. P. Feynman, R. B. Leighton, M. Sands, Pearson Education.

5. Introduction to Special Relativity, R. Resnick, John Wiley and Sons. University Physics, Ronald Lane Reese, Thomson Brooks/Cole.

6. Mechanics, D.S. Mathur, S. Chand and Company Limited, University Physics.

7. J.W. Jewett, R.A. Serway, Cengage Learning Theoretical Mechanics, M.R. Spiegel, Tata McGraw Hill.

*** Latest editions of all the suggested books are recommended**

Semester II
Environmental Studies

Course Code: TMU201 **L T P C**
2 1 0 3

Course Outcomes:

CO 1 Based on this course, the Engineering graduate will understand / evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

Course Content:

Unit I **(Lectures 08)**

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.

Unit II **(Lectures 08)**

Natural Resources: Renewable & Non-Renewable resources; Landresources and landuse change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.

Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India

Unit III **(Lectures 08)**

Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

Unit IV **(Lectures 08)**

Environmental policies & practices: Climate change & Global Warming (Greenhouse Effect),Ozone Layer -Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context

Unit V **(Lectures 08)**

Human Communities & Environment: Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study

Field Work:

1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/ rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; pond, river etc.

Text Books:

1. "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.
2. "Introduction to Environmental Engineering and Science", Masters, G. M., Prentice Hall India Pvt. Ltd.
3. "Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co.

Reference Books:

1. "Biodiversity and Conservation", Bryant, P. J., Hypertext Book
2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication

***Latest editions of all the suggested books are recommended.**

Semester II
English Communication- II

Course Code: TMUGE201

L	T	P	C
2	0	2	3

Course Outcomes: At the end of the semester, the learners will be able to-

CO1. Remembering & understanding the basics of English Grammar and Vocabulary.

CO2. Understanding the basics of Listening, Speaking & Writing Skills.

CO3. Understanding principles of letter drafting and various types of formats.

CO4. Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations.

CO5. Analyzing different types of listening, role of Audience & Locale in presentation.

CO6. Drafting Official Letters, E-Mail & Paragraphs in correct format.

Course Contents:

Unit - I Functional Grammar **(10 hours)**

- Prefix, suffix and One words substitution
- Modals
- Concord

Unit - II Listening Skills **(04 hours)**

- Difference between listening & hearing, Process and Types of Listening
- Importance and Barriers to listening

Unit - III Writing Skills **(12 hours)**

- Official letter and email writing
- Essentials of a paragraph,
- Developing a paragraph: Structure and methods
- Paragraph writing (100-120 words)

Unit - IV Strategies & Structure of Oral Presentation **(08 hours)**

- Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body langauge
- Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch.
- Modes of speech delivery and 5 W's of presentation

Unit - V Value based text reading: Short Essay (Non- detailed study) **(06 hours)**

- How should one Read a book? - Virginia Woolf

Text Books:

1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi.

Reference Books:

a. Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers
b. Sood Madan "*The Business letters"* Goodwill Publishing House, New Delhi
c. Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi.

Methodologies:

1. Words and exercises, usage in sentences.
2. Language Lab software.
3. Sentence construction on daily activities and conversations.
4. Format and layout to be taught with the help of samples and preparing letters on different subjects.
5. JAM sessions and Picture presentation.
6. Tongue twisters, Newspaper reading and short movies.

7. Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized.
8. Text reading: discussion in detail, critical appreciation by reading the text to develop students' reading habits with voice modulation.

Note:

- Class (above 30 students) will be divided in to two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		
20 Marks (Best 2 out of Three CTs) ***(From Unit-I, III & V)***	10 Marks (Oral Assignments) ***(From Unit-II &IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit-1, III & V)***	20 Marks (External Viva)* ***(From Unit- II & IV)***	**100**

*Parameters of External Viva

Content	**Body Language**	**Communication skills**	**Confidence**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note*: External Viva will be conducted by 2-member committee comprising*

a. *One Faculty teaching the class*
b. *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Semester II
General Chemistry- II (Lab)

Course Code: BAS262 **L T P C**
0 0 4 2

List of Experiments:
Thermochemistry

1. Determination of heat capacity of calorimeter for different volumes.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO3, NH4Cl).
5. Determination of enthalpy of hydration of copper sulphate.
6. Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.
7. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.
8. Chemical Kinetics Study the kinetics of the following reactions.
   a). Initial rate method: Iodide-persulphate reaction
   b). Integrated rate method:
9. Acid hydrolysis of methyl acetate with hydrochloric acid.

Text &Reference Books:

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall.
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman.
3. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi.

***Latest editions of all the suggested books are recommended.**

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester-II
Mechanics (Lab)

Course Code: BAS267/BAS166

L	T	P	C
0	0	4	2

List of Experiments:

Note: Select any ten experiments from the following list.

1. Measurements of length (or diameter) using verniercaliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) Spring constant, (b) **g** and (c) Modulus of rigidity.
5. To determine the Moment of Inertia of a Flywheel.
6. To determine **g** and velocity for a freely falling body using Digital Timing Technique
7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
8. To determine the Young's Modulus of a Wire by Optical Lever Method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
10. To determine the elastic Constants of a wire by Searle's method.
11. To determine the value of g using Bar Pendulum.
12. To determine the value of g using Kater's Pendulum.

Following experiments are added in session 2018-19:

13. To determine Modulus of Rigidity by using Torsion pendulum.
14. To determine Young's Modulus in case of Cantilever using Pin and Microscope.
15. To determine the frequency of A.C. mains by means of a sonometer.

Text &Reference Books:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, Asia Publishing House
2. B.Sc. Practical Physics, C. L. Arora, S. Chand Publishing.
3. B.Sc. Practical Physics, H. Singh & P.S. Hemne, S. Chand Publishing.
4. Engineering Practical Physics, S. Panigrahi& B. Mallick, Cengage Learning India Pvt. Ltd.
5. Practical Physics, G.L. Squires, Cambridge University Press.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: TMUGA-201	**Value Added Course** **B.Sc.(H) Mathematics- Semester-II** **Analytical Reasoning**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the arithmetical concepts in Ratio Proportion Variation.	
CO2.	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.	
CO3.	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram.	
CO4.	Examining the optimized approach to solve logs and Surds.	
Course Content:		
Unit-1:	**Ratio, proportions and variations** Concept of ratios, proportions, variations, properties and their applications	**5 Hours**
Unit-2:	**Time and Work** Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	**6 Hours**
Unit-3:	**Time Speed Distance** Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	**6 Hours**
Unit-4:	**Logs and Surds** Concept and properties of logs, surds and indices	**4 Hours**
Unit-5:	**Coding and decoding** Sequential coding, reverse coding, abstract coding	**3 Hours**
Unit-6:	**Syllogisms** Two statements, three statements	**4 Hours**
Unit-7:	**Venn diagram** Basic concept and applications	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: BAS315	B.Sc. (H) Mathematics - Semester-III **Partial Differential Equation**	L-4 T-1 P-0 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** basic concept of Partial differential equation, Lagrange's method.	
CO2.	**Understanding** the basic concept of Monge's method, classification & application of Partial differential equation .	
CO3.	**Applying** the concept of Partial differential equation to find out the complete integral ,particular integral & general solution.	
CO4.	**Applying** the concept of Partial differential equation to find out the solution of Monge's method.	
CO5.	**Applying** the concept of PDE to solve the heat & wave equation of 1-D & 2-D.	
Course Content:		
Unit-1:	Partial differential equation of first order and first degree, Origin of partial differential equation, Lagrange's method for P.p +Q.q = R.	**8 Hours**
Unit-2:	Partial differential equation of second order, Linear partial differential equation, its complete integral, particular integral and general solution, general solution of linear partial differential equation with constant coefficients.	**8 Hours**
Unit-3:	Monge's form of solution of form Rr + Ss + Tt = V	**8 Hours**
Unit-4:	Classification of Partial Differential Equation (Identify Parabolic, Elliptic, Hyperbolic)	**8 Hours**
Unit-5:	Application of Partial Differential Equation (Heat & wave equations of 1 & 2 dimensional only)	**8 Hours**
Text Books:	**1.** "Partial differential Equation" by M. D. Raisinghania, S. Chand & Company.	
Reference Books:	**1.** "Partial differential Equation" by I. N. Sneddon, Mc graw Hill & Company. **2.** "Partial Differential with Boundary Value Problems" S Singh, J. P. Chauhan Shikaha Sahitiya Prakasha. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1) https://www.youtube.com/watch?v=O3ahEHAX-KU 2) https://www.youtube.com/watch?v=33vJ1wz3rfU&app=desktop 3) https://www.youtube.com/watch?v=vZEN4NXhmag 4) fhttps://www.youtube.com/watch?v=U58LykHWj3A	

Course Code: BAS316	**B.Sc. (H) Mathematics - Semester-III** **Modern Algebra**	**L-4 T-1 P-0 C-5**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** of groups, permutation, isomorphism.	
CO2.	**Understanding** to solve problems with the concept of Vector space to diverse situations in mathematical contexts.	
CO3.	**Applying** the ability to think critically and principles of algebra and relating them to the number system and analyze them from abstract point of view.	
CO4.	**Applying** theorems to solve problems in number theory, use of ring theory to cryptography.	
CO5.	**Analyzing** of various concepts of Ring, Integral Domain and Fileds.	
Course Content:		
Unit-1:	Groups, sub-groups, Costes, Lagranges theorem, permutation group, Cayley's theorem, Isomorphism of groups.	**10 Hours**
Unit-2:	Basic concepts of Rings, Subrings, Integral domain and fields.	**10 Hours**
Unit-3:	Automorphism, Normaliser, Centre of a group, Syllabus theorem.	**8 Hours**
Unit-4:	Homomorphism of rings and its properties, Rings of Polynomials etc.	**6 Hours**
Unit-5:	Vector Space, properties and theorem of vector space.	**6 Hours**
Text Books:	1. "Algebra" by I. N. Hertein, Wiley and Company. 2. "Modern Algebra" by Shanti Narayan, S. Chand and Company. 3. "Algebra" J. K. Goyal and K. P. Gupta, Pragati Prakashan.	
Reference Books:	1. "Algebra" by M. Jacobson, Banz, W. H. Erconma New Delhi. 2. "Abstract Algebra" by D. S. Malic, J. N Mordesas and M. K. Sen, Pragati Prakashan. 3. "Modern Algebra" by Saran and Goyal, Pothishala Publication. *Latest editions of all the suggested books are recommended. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	• https://www.youtube.com/watch?v=g7L_r6zw4-c • https://www.youtube.com/watch?v=TCcSZEL_3CQ • https://www.youtube.com/watch?v=_RTHvweHlhE • https://www.youtube.com/watch?v=F0wA0xLZSQ8	

Course Code: BAS319	B.Sc.(H) Mathematics- Semester-III **Numerical Analysis**	L-5 T-1 P-0 C-6
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** finite differences and interpolation with equal intervals and Unequal Intervals.	
CO2.	**Understanding** introduction of operators and its properties.	
CO3.	**Applying** numerical solution of first order differential equation using Eulers, Picards and Runge Kutta methods and derivative using forward and backward difference interpolation.	
CO4.	**Analyzing** Lagrange's interpolation formula for unequal intervals.	
CO5.	**Evaluating** Numerical differentiation and Integration, Trapezoidal Formulae, Simpson's Rule, Weddle rule and Cote's formula.	
Course Content:		
Unit-1:	Introduction of finite differences; Forward and backward differences, Forward and backward differences table, Missing term problems, General Introduction of operators and its properties.	**8 Hours**
Unit-2:	Interpolation with equal intervals and Unequal Intervals; Newton Gregory Forward and Backward Formula, Divided difference table, Newton's divide difference Formula, Lagrange's Interpolation Formula, Hermit Interpolation formulas using differences.	**8 Hours**
Unit-3:	Central difference formulae, Bessel's and Strling formula, Gauss Forward and Backward, Evertt formula.	**8 Hours**
Unit-4:	Numerical differentiation and Integration, Derivative using forward and backward difference interpolation formula, Trapezoidal Rule, Simposon's one-third and three-eight rules, Weddle rule and Cotes formula.	**8 Hours**
Unit-5:	Numerical solution of first order differential equation using Eulers, Picards and Runge Kutta methods.	**8 Hours**
Text Books:	**1**. Numerical analysis", by Burden, Cengage Learning.	
Reference Books:	**1.** "Numerical Analysis" by P.P. Gupta and Sanjay Gupta, Krishana Prakashan Mandir. **2.** "Numerical Analysis" by S.S. Sastry, Prentice Hall of India. **3.** "Introduction to Numerical Analysis" by C. E. Froberg, Addition Welly Publishing Co. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=6x_5R9zggIw 2. https://www.youtube.com/watch?v=PBjGdQOghJE 3. https://www.youtube.com/watch?v=G7p0nvtUFn0	

Course Code: TMUGE301	**B.Sc.(H) Mathematics- Semester-III** **English Communication- III**	**L-2 T-0 P-2 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** knowledge of grammar to face competitive exams.	
CO2.	**Understanding** advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context.	
CO3.	**Understanding** listening for effective communication.	
CO4.	**Applying** their English grammar knowledge in day to day context.	
CO5.	**Applying** writing and comprehensive skills in English.	
CO6.	**Analyzing** Comprehending & enriching their vocabulary through prescribed text.	
Course Content:		
Unit-1:	English Grammar & Vocabulary (14 hours) **(a)** Correction of Common Errors (with recap of English Grammar with its usage in practical context.) **(b)** Synthesis: Simple, complex and compound sentence **(c)** Commonly used Idioms & phrases (Progressive learning whole semester)	**14 Hours**
Unit-2:	Speaking Skills (10 hours) **(a)** Art of public speaking **(b)** Common conversation **(c)** Extempore **(d)** Power Point Presentation (PPt) Skills: Nuances of presenting PPTs	**10 Hours**
Unit-3:	Comprehension Skills (06 hours) **(a)** Strategies of Reading comprehension: Four S's **(b)** How to solve a Comprehension (Short unseen passage: 150-200 words)	**6 Hours**
Unit-4:	Professional Writing (03 hours) **(a)** Preparing Notice, Agenda & Minutes of the Meeting	**7 Hours**
Unit-5:	Value based text reading: Short story (07 hours) **(a)** The Barber's Trade Union - Mulk Raj Anand	**3 Hours**
Text Books:	**(d)** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	**1.** Wren & Martin *"High School English Grammar and Composition"* S.Chand & Co.Ltd., New Delhi. **2.** Kumar Sanjay &Pushplata *"Communication Skills"* Oxford University Press,	

	New Delhi. **3.** Agrawal, Malti *"Professional Communication"* Krishana Prakashan Media (P) Ltd. Meerut. ***Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	1- https://www.youtube.com/watch?v=dpYltVtsS_Q 2- https://www.youtube.com/watch?v=Z8HttKW8jVE 3- https://www.youtube.com/watch?v=srn5jgr9TZo 4- https://www.youtube.com/watch?v=En9-8xWYWqk 5- https://www.youtube.com/watch?v=aUEpmAo0OvM	
Methodology:	**1.** Idiom & Phrases and exercises, usage in sentences. **2.** Language Lab software. **3.** Power Point presentation. **4.** Newspaper reading, short articles from newspaper to comprehend and short movies. **5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized. **6.** Text reading: discussion in detail, Critical appreciation by reading the text to develop students' reading habits with voice modulation.	

Evaluation Scheme

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) (From Unit-I, III, IV & V)	10 Marks (Oral Assignments) (Unit -II)	10 Marks (Attendance)	40 Marks (External Written Examination) (From Unit-1, III, IV & V)	20 Marks (External Viva)* (Unit -II)	100

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: BHM315	B.Sc.(H) Mathematics- Semester-III **Human Values & Professional Ethics**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the importance of value education in life and method of self-exploration.	
CO2.	**Understanding** 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.	
CO3.	**Applying** right understanding about relationship and physical facilities.	
CO4.	**Analysing** harmony in myself, harmony in the family and society, harmony in the nature and existence.	
CO5.	**Evaluating** human conduct on ethical basis.	
Course Content:		
Unit-1:	Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration– content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics.	**8 Hours**
Unit-2:	Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study.	**8 Hours**
Unit-3:	Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship.	**8 Hours**
Unit-4:	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	**8 Hours**
Unit-5:	Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics:	**8 Hours**

	a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems c) Ability to identify and develop appropriate technologies and management patterns for above production systems.	
Text Book:	**1.** R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Value Education.	
Reference Books:	**1.** Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA 2. E.F. Schumacher, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain. **2.** A Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak. **3.** Sussan George, How the Other Half Dies, Penguin Press. Reprinted. **4.** PL Dhar, RR Gaur, Science and Humanism, Commonwealth Purblishers. **5.** A.N. Tripathy, Human Values, New Age International Publishers. **6.** E G Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	https://www.youtube.com/watch?v=Cnw1nK3K5qk https://www.youtube.com/watch?v=hTTCMrQyF8E	

Course Code: BGP311	B.Sc.(H) Mathematics- Semester-III **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: TMUGA-302	Value Added Course B.Sc. (H) - Semester-III **Modern Algebra and Data Management**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.	
CO4.	Correlating the various arithmetic concepts to check sufficiency of data	
Course Content:		
Unit-1:	**Number theory** Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity(Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	**8 Hours**
Unit-2:	**Data interpretation** Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	**7 Hours**
Unit-3:	**Data Sufficiency** Introduction of Data Sufficiency, different topics based DS	**5 Hours**
Unit-4:	**Permutations and combinations** Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	**6 Hours**
Unit-5:	**Probability** Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: TMUGS-301	Value Added Course B.Sc.(H) Mathematics- Semester-III **Managing Self**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	**1.** Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education **2.** Tracy, Brian, Time Management (2018), Manjul Publishing House **3.** Hill, Napolean, Think and grow rich (2014), Amazing Reads **4.** Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub **5.** https://www.hloom.com/resumes/creative-templates/ **6.** https://www.mbauniverse.com/group-discussion/topic.php **7.** Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan **8.** Burne, Eric, Games People Play (2010), Penguin UK **9.** https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Course Code: BAS 314	Generic Elective- V B.Sc.(H) Mathematics- Semester-III **Elements of Modern Physics**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** concepts of Black body radiation, Photoelectric effect and Compton scattering to learn the beginning of quantum mechanics.	
CO2.	**Understanding** Young's two slit interference of light into the two slit interference of particles (e.g. photon, electron, atom etc.)	
CO3.	**Understanding** the matter wave and deducing the Schrodinger wave equation.	
CO4.	**Understanding** the laws of radioactive decay including alpha-, beta- and gamma decay, fission and fusion nuclear process.	
CO5.	**Applying** the Heisenberg's uncertainty principle to deduce the Size and structure of atomic nucleus and its relation with atomic weigh.	
CO6.	**Applying** the Heisenberg's uncertainty principle to prove the impossibility of an electron being in the nucleus	
Course Content:		
Unit-1:	**Planck's quantum-I:** Planck's constant and light as a collection of photons; Blackbody Radiation: Quantum theory of Light; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves. Two-Slit experiment with electrons.	**8 Hours**
Unit-2:	**Planck's quantum-II:** Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles	**8 Hours**
Unit-3:	**Schrodinger Equations:** Schrodinger equations, Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force	**8 Hours**
Unit-4:	**Fission and fusion:** Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Fusion and thermonuclear reactions driving stellar energy.	**8 Hours**
Unit-5:	**Radioactivity:** stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.	**8 Hours**
Text Book:	**1.** Concepts of Modern Physics, Arthur Beiser, McGraw-Hill.	
Reference Books:	**1.** Introduction to Quantum Mechanics, David J. Griffith, Pearson Education. **2.** Physics for scientists and Engineers with Modern Physics, Jewett and Serway, Cengage Learning. **3.** Modern Physics, G.Kaur and G.R. Pickrell, McGraw Hill.	

	***Latest editions of all the suggested books are recommended**	
Additional electronic reference materials	https://www.youtube.com/watch?v=ymGdrb-pCaI https://www.youtube.com/watch?v=vPJidbP_oLM https://www.youtube.com/watch?v=iMhDYarsfII	

Course Code: BCS311	Generic Elective- V B.Sc.(H) Mathematics- Semester-III **Database Management System**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of Database Management System	
CO2.	**Applying** the commercial relational database system (Oracle).	
CO3.	**Applying** the relational algebra expressions for queries.	
CO4.	**Applying** the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.	
CO5.	**Analyzing** the issues of transaction processing and concurrency control.	
Course Content:		
Unit-1:	**Introduction:** Scope and purpose of database system, view of data, relational databases, database architecture, transaction management, database system Vs file system, Database system concept and architecture, data definitions language, DML. **Data Models**: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction	**8 Hours**
Unit-2:	**Database design and ER Model**: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity etc, Codd's rules, Relational Schemas, Introduction to UML, Relational database model: Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF)	**8 Hours**
Unit-3:	**Relational data Model and Language**: Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, Relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, Computational capabilities, constraints, Views. **Introduction on SQL**: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, and Procedures in SQL/PL SQL.	**8 Hours**
Unit-4:	Usage of Oracle: **1.** Installing oracle **2.** Creating Entity-Relationship Diagram using case tools. **3.** Writing SQL statements Using ORACLE **4.** MYSQL: a) Writing basic SQL SELECT statements. b) Restricting and sorting data.	**8 Hours**

	c) Displaying data from multiple tables. d) Aggregating data using group function. e) Manipulating data. f) Creating and managing tables. **5.** Normalization in ORACLE. **6.** Creating cursor in oracle. **7.** Creating procedure and functions in oracle. **8.** Creating packages and triggers in oracle.	
Unit-5:	Transaction management: ACID properties, serializability and concurrency control Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	**8 Hours**
Text Books:	**1.** Elmasri, R., Navathe, S., Fundamentals of Database Systems, Addison-Wesley. **2.** G. K. Gupta, "Data Base Management", Tata Mc Graw Hill. **3.** Atul Kahate, "Introduction to Database Management Systems" Pearson Education, New Delhi, 2006. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	https://www.youtube.com/watch?v=wkOD6mbXc2M https://www.youtube.com/watch?v=siKBrudOYwo	

Course Code: BAS367	**Skill Enhancement Course- I** **B.Sc.(H) Mathematics- Semester-III** **Introduction to MATLAB**	**L-0** **T-1** **P-2** **C-2**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** simple program modules to implement single numerical methods and algorithms.	
CO2.	**Applying** to use basic flow controls (if-else, for, while).	
CO3.	**Applying** Test program output for accuracy using hand calculations and debugging techniques	
CO4.	**Applying** multiple program modules into larger program packages	
CO5.	**Analyzing** the generate plots and export this for use in reports and presentations.	
Course Content:		
Unit-1:	MATLAB Software Working Environment: MATLAB Initializing & Ending, Quick Access Tool Bar, Command Window, Command History, Workspace Browser, Current folder window, Editor Window, Help Browser, Figure Window, Simulink Window, Creating Command Shortcuts, MATLAB Path Options MATLAB Programming, Debugging MATLAB codes.	**8 Hours**
Unit-2:	MATLAB Input Entry & Executing Commands & Methods: Input and Output, Symbolic Mathematics, Arithmetic, Algebra, Symbolic Expressions, Variable Precision and Exact Arithmetic, Errors in Input, Variables and Assignments, Predefined Variables, Operators & Special Characters, Control Structures, Input & Output Commands. Matrices: Arrays, Matrix representation, Matrix & Inverse of Matrix, Entry Retrieving, Matrix Division, Eigen values and vectors, Special matrices.	**8 Hours**
Unit-3:	Polynomials: Polynomial Overview, Representing Polynomials, Arithmetic operations on polynomials, Polynomial Roots, Polynomial coefficients, Polynomial Evaluation, Convolution and De-convolution. Solving Equations: Solution to first order differential Equations, Solving Second Order Differential Equations, Partial Fraction Expansion.	**8 Hours**
Unit-4:	MATLAB Graphics: 2-D Plot, Plotting Process, Creating a Graph, Exploring Data, Editing the Graph Components, Annotating Graphs, Printing and Exporting Graphs, Accessing Properties with the Property Inspector, Plotting Two Variables with Plotting Tools, Changing the Appearance of Lines and Markers, Placing Markers at Every Tenth Data Point, Adding More Data to the Graph, To add data using the Plot Browser, Changing the Type of Graph, Modifying the Graph Data Source, Providing New Values for the Data Source, Figure Windows, Clearing the Figure for a New Plot, Controlling the Axes, Setting Axis Limits, Setting the Axis Aspect Ratio - Setting Axis Visibility, Setting Grid Lines.	**8 Hours**
Unit-5:	Application Tools: Partial Differential Equation (PDE), Curve fitting	**8 Hours**

Text Books:	**1.** Amos Gilat, "MATLAB: An Introduction with Applications", Wilay Publication ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	• https://www.youtube.com/playlist?list=PLRWKj4sFG7-6_Xr9yqg6SMr_F80KdFVhN • https://www.youtube.com/playlist?list=PLp6ek2hDcoNAyvh2A1y628-9fzXq6pXuf • https://www.youtube.com/playlist?list=PLYdXvSx87cgRJfv6gZl7GjAs0GNvyg-uS	

Experiments:

Experiments:	Note: Minimum 15 experiments should be performed:	
Experiment-1:	To find the Local Environment for MATLAB programming.	
Experiment-2:	Enter the m*n order matrix.	
Experiment-3:	Find the matrix transpose.	
Experiment-4:	Find the inverse of matrix.	
Experiment-5:	Find the addition, subtraction & multiplication of matrix.	
Experiment-6:	If $V_1 = 5v$, $V_2 = 6v$, $Z_{11}=2$, $Z_{12}=1$, $Z_{21}=3$ $Z_{22}=4$, get the value of I_1 and I_2?	
Experiment-7:	If A1 = [2 7 6 8 9 10] and B1 = [6 4 3 2 3 4], Find a) C1 = A1.*B1 b) D1 = A1./B1	
Experiment-8:	If r1 = [7 3 5] and s1 = [2 4 3], get a) q1 = r1.^s1 b) q2 = r1.^2	
Experiment-9:	State if the following statements are true or false, a) If a MATLAB statement ends with a semicolon (;) MATLAB evaluates the statement but suppresses the display of the results. b) The end of each row in entering a matrix, is indicated by a semicolon (;) c) MATLAB is case sensitive in naming variables only.	
Experiment-10:	Enter the following matrix, **A = 1 3 4 2** **2 0 1 6** **4 1 2 7** **0 3 6 4** a. Get the diagonal of the matrix A b. Get the sum of each column in the matrix A c. Get the sum of each row in the matrix A d. Get the sum of all elements in the matrix A e. Add 2 to the element in the 2nd row and 3rd column	
Experiment-11:	Enter the following complex number, z = 2-j3 then a. Get the real and the imaginary parts of z b. Get the magnitude and the phase angle of z c. If y = 3+j5, calculate the following: y+z, y-z, y×z	

Experiment-12:	If w = [1+j 5-2*j; 3+2*j 4+3*j] a. Get the conjugate transpose b. Get the point transpose c. Type the elements of 2nd row only	
Experiment-13:	Reshape matrix.	
Experiment-14:	Eliminate Rows of matrix.	
Experiment-15:	Sorting a matrix	
Experiment-16:	Plot, xlabel, ylabel, title, and axis commands;	
Experiment-17:	Find difference between plot, semilogy, semilogx, logog commands	
Experiment-18:	Bar plot, Pie chart, 3D plots command	
Experiment-19:	Creating and performing symbolic computations.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: BAS415	B.Sc.(H) Mathematics- Semester-IV **Ordinary Differential Equation**	L-4 T-1 P-0 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** linear differential equation of second order.	
CO2.	**Understanding** finding general solution linear differential equation of second order ordinary simultaneous linear differential equation.	
CO3.	**Understanding** solution of Pfaffian differential forms/equations and integration in series.	
CO4.	**Applying** Picards' iteration method uniqueness and existence theorems.	
CO5.	**Evaluating** conditions using uniqueness and existence theorems.	
Course Content:		
Unit-1:	Linear Equation of second order finding general solution of $d^2y/dx^2 + P(dy/dx) + Qy=0$ by removing first derivative; Changing independent variable, Method of Variation of parameters, Normal form and Method of operational operators	**8 Hours**
Unit-2:	Ordinary Simultaneous linear differential Equation, Linear differential Equation of the form $dx/P = dy/Q = dz/R$	**8 Hours**
Unit-3:	Pfaffian differential forms and equations, Necessary and sufficient condition for Inerrability of $Pdx + Qdy + Rdz = 0$	**8 Hours**
Unit-4:	Integration in series; Ordinary and singular points, Solution about ordinary point, Solution about singular point (Frobenius Method)	**8 Hours**
Unit-5:	Picards' Iteration method, Uniqueness and existence theorems	**8 Hours**
Text Books:	**1.** "Differential Equation" by Zill, Cengage Learning.	
Reference Books:	**1.** "Differential Equation" by M. D. Raisinghania, S. Chand & co. **2.** "A Treatise on diff. Equation" by A. R. Forsyth, Macmillan & company Ltd. **3.**"Introduction on Differential Equation" by D.A. Murray, Orient Longman India. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**https://www.youtube.com/watch?v=FZZS91nfRgc** **https://www.youtube.com/watch?v=oTN7hGoSPMw**	

Course Code: BAS416	**B.Sc.(H) Mathematics- Semester-IV** **Real Analysis**	**L-4 T-1 P-0 C-5**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of limit, continuity and differentiability.	
CO2.	**Understanding** the concepts of sequence, infinite series and various test for convergent.	
CO3.	**Understanding** the concepts of Riemann integral, uniform convergence and improper integral.	
CO4.	**Applying** the various test for convergent to test the nature of sequence and series.	
CO5.	**Applying** the concepts of M-test to test the nature of function of sequences.	
Course Content:		
Unit-1:	Limits, left and right-hand limit, Theorems on limit, Concept of Continuity and discontinuity, Types of continuity and discontinuity, properties of continuous function, A necessary and sufficient conditions of discontinuity, Darboux's theorem, Mean Value theorems, Differentiability.	**8 Hours**
Unit-2:	Sequence of real numbers convergent and non-convergent, Sequence algebra of sequences, Theorem on limit on limit of sequence, Monotone Sequence, Real sequence, Bounded sequence, convergent sequence, Least upper bound and greatest lower bound, limit of a sequence, theorem on convergent sequence, Subsequence.	**8 Hours**
Unit-3:	Infinite Series and its convergences, Test for convergences of positive term series, comparison test, Ratio test, Cauchy's Root test, Raab's test, Logarithmic test, Integral test.	**8 Hours**
Unit-4:	Definition existence and properties of Riemann integral of a bounded function, Darboux theorem, Condition of integrability, Integral as limit of sum, Fundamental Theorem of Calculus.	**8 Hours**
Unit-5:	Definition of uniform convergence, Cauchy's criterion for uniform convergence Weirstress test, M-test, Uniform convergence and continuity, Definition of improper integral and convergence of improper integral.	**8 Hours**
Text Books:	1. "A course of Mathematical Analysis" by Shanti Narayan, S. Chand & Co.	
Reference Books:	1. "Real Analysis" by P. K. Mittal, S. J. Prakashan . 2. "Real Analysis" by P. K. Gupta and Sharada Gupta, S. Chand & Co. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=ubg8s0ACrkA https://www.youtube.com/watch?v=ZEDxkht_tcs	

Course Code: BAS432	**B.Sc.(H) Mathematics- Semester-IV** **Operations Research**	**L-5 T-1 P-0 C-6**
Course Outcomes :	**On completion of the course, the students will be :**	
CO1.	**Understanding** the Mathematical formulation of optimization problems and their solution approach.	
CO2.	**Understanding** the duality concept in linear programming problem.	
CO3.	**Understanding** the Mathematical formulation of transportation problems and assignment problems and find their optimality.	
CO4.	**Understanding** the concept of job sequencing and graphic solution approach of the n machine problem.	
CO5.	**Understanding** the concept of game theory and their various solution methods.	
Course Content:		
Unit-1:	History and Back ground of subject, Different meaning of O.R. and Phases, characteristic and Models of O.R.	**8 Hours**
Unit-2:	Linear Programming, Mathematical formation of LPP, Graphical solution of LPP, general linear programming problem, simplex methods, duality.	**8 Hours**
Unit-3:	Transportation Problem, Assignment Problem, matrix form of: Transportation Problem. Initial basic physible solution, Optimality and transportation algorithms, balanced and unbalanced transportation problem and assignment problem.	**8 Hours**
Unit-4:	Job sequencing, Replacement model, sequencing method of two machine three machine and n machine problem, graphic solution, Replacement of item deterioting with time, Replacement of item that fails continuously, and general replacement problem.	**8 Hours**
Unit-5:	Game Theory, two-person zero sum game, saddle point maximin and minimax, game of type 2*2, *n** 2 game graphic solution and with dominance property.	**8 Hours**
Text Books:	**1.** "Operation Research" by Winston, Cengage Learning.	
Reference Books:	**1.** "Operation Research" by H.A Tata, Maemillar & Company. **2.** "Operation Research" by P. K. Gupta and D.S. Hira, S Chand & Company. **3.** "Operation Research" by R. K. Gupta, Krishna Prakasha. *** Latest editions of all the suggested books are recommended**	
Additional electronics reference material:	1. https://www.youtube.com/playlist?list=PLLy_2iUCG87Bq8RGMTdeFZiB-87V4i9p1 2. https://www.youtube.com/playlist?list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX 3. https://www.youtube.com/playlist?list=PLWoXNEI-KK1mCv_EL4OdF_-6FXryaZ11N	

Course Code TMUGE401	B.Sc.(H) Mathematics- Semester-IV **English Communication – IV**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** adequate knowledge of grammar and vocabulary through prescribed text to address competitive exams.	
CO2.	**Understanding** the value of listening to understand the basic content.	
CO3.	**Understanding** the usage of English grammar in day to day context.	
CO4.	**Understating** about the skills required in corporate world.	
CO5.	**Applying** writing and comprehensive skills in English.	
CO6.	**Creating** a simple proposal and report.	
Course Content:		
Unit-1:	**Vocabulary & Grammar** **(12 hours)** • Homophones and Homonyms • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Transformation of sentences	**12 Hours**
Unit-2:	**Essence of Effective listening & speaking** **(05 hours)** • Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned* • Impromptu	**5 Hours**
Unit-3:	**Professional Writing** • Proposal: Significance, Types, Structure & AIDA • Report Writing: Significance, Types, Structure& Steps towards Report writing	**8 Hours**
Unit-4:	**Job Oriented Skills** • Cover Letter • Preparing Resume and Curriculum-Vitae • Interview: Types of Interview, Tips for preparing for Interview and Mock Interview • Corporate Expectation & Professional ethics: Skills expected in corporate world.	**10 Hours**
Unit-5:	**Value based text reading:** Short story • A Bookish Topic - R.K. Narayan	**5 Hours**
Text Books:	**1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	**1.** Joseph, Dr C.J. & Myall E.G. "A *Comprehensive Grammar of Current English*" Inter University Press, Delhi **2.** Chaudhary Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. **3.** Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi. ***Latest editions of all the suggested books are recommended.**	

Additional Electronics Reference Material	1- https://www.youtube.com/watch?v=dpYltVtsS_Q 2 - https://www.youtube.com/watch?v=QthdqIB0WS8 3 - https://www.youtube.com/watch?v=MrgHfK8Pcfk 4 - https://www.youtube.com/watch?v=860LtRxP3rw 5 - https://www.youtube.com/watch?v=0nN7Q7DrI6Q	
Methodology:	**1.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion. **2.** Language Lab software. **3.** Sentence transformation on daily activities and conversations. **4.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips) **5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.	

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		
20 Marks (Best 2 out of Three CTs) ***(From Unit - I, III, IV & V)***	10 Marks (Oral Assignments) ***(From Unit - II & IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit -I, III, IV & V)***	20 Marks (External Viva)* ***(From Unit -II & IV)***	**100**

*Parameters of External Viva

Content	**Body Language**	**Communication skills**	**Confidence**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**: External Viva will be conducted by 2-member committee comprising*

a) *One Faculty teaching the class*

b) *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: BHM415	**B.Sc.(H) Mathematics- Semester-IV** **Entrepreneurship**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** the concepts and skills needed to run a business successfully.	
CO2.	**Applying** the steps of project formulation and market research.	
CO3.	**Analyzing** the techno economic feasibility of a project.	
CO4.	**Analyzing** various growth strategies in small scale industry.	
CO5.	**Evaluating** breakeven point, working capital requirements, and taxes.	
Course Content:		
Unit-1:	**Entrepreneurship:** Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.	**8 Hours**
Unit-2:	**Motivation:** Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	**8 Hours**
Unit-3:	**Business:** Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	**8 Hours**
Unit-4:	**Financing and Accounting:** Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	**8 Hours**
Unit-5:	**Support to Entrepreneurs:** Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	**8 Hours**
Text Book:	1. Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd., Ram Nagar, New Delhi.	
Reference Books:	1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill. 2. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech.	

	3. Rajeev Roy, 'Entrepreneurship', Oxford University Press. 4. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", Cengage Learning. ***Latest editions of all the suggested books are recommended.**	

Evaluation Scheme:

Internal Evaluation	External Evaluation	Total Marks
40 Marks	**60 Marks**	
The Internal evaluation will be performed by the internal faculty on the basis of the below mentioned parameters: • Problem Identification • Data Collection and Data Analysis • Case study • Proposal of innovative Business idea	External evaluation will be performed by the external examiner on the basis of following parameters: • Report • Presentation • VIVA	**100**

Course Code: BGP411	B.Sc.(H) Mathematics- Semester-IV **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: TMUGA-402	Value Added Course B.Sc. (H) - Semester-IV **Advance Algebra and Geometry**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.	
CO2.	Illustrating the different concepts of Height and Distance and Functions.	
CO3.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.	
CO4.	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.	
Course Content:		
Unit-1:	**Clocks and calendars** Introduction , Angle based , faulty Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year	**5 Hours**
Unit-2:	**Set theory** Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams	**4 Hours**
Unit-3:	**Heights and Distance** Basic concept, Word problems	**3 Hours**
Unit-4:	**Functions** Introduction to Functions, Even and Odd Functions, Recursive	**3 Hours**
Unit-5:	**Problem Solving** Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable	**6 Hours**
Unit-6:	**Data Sufficiency** Introduction, Blood relation based, direction based, ranking based	**5 Hours**
Unit-7:	**Crypt Arithmetic** Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic, Company Specific Pattern	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: TMUGS-401	Value Added Course B.Sc.(H) Mathematics- Semester-IV **Managing Work and Others**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**8 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com 6. https://www.hloom.com/resumes/creative-templates/	

	7. https://www.mbauniverse.com/group-discussion/topic.php 8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Course Code: BAS426	Skill Enhancement Course-II B.Sc.(H) Mathematics- Semester-IV **Introduction to Statistical Package for Social Sciences**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** the concept of data analysis, general description, functions, menus and commands.	
CO2.	**Understanding** the different type of variables as well as computing new variables.	
CO3.	**Understanding** the concept of Descriptive analysis of data , creating & editing graphs.	
CO4.	**Applying** the Statistical test(Paramatric & non parametric) for independent samples, paired samples.	
CO5.	**Evaluating** the correlation and regression analysis and cluster sampling.	
Course Content:		
Unit-1:	**Introduction to SPSS: Definition of SPSS, Uses and its application in mathematics & Statistics,** Data analysis with SPSS: General aspects, discrete and continuous data, Primary and secondary data , variable, output, and syntax view; General description, data editing factor: completeness of data, consistency of data, homogeneity of data, functions, menus.	**8 Hours**
Unit-2:	**Input and data management:** Defining variables; Entering and modifying data: manual and automated input of data, and file import; Data Arrangement: Listing cases, replacing missing values, computing new variables, exploring data, selecting cases.	**8 Hours**
Unit-3:	**Descriptive analysis of data:** Frequencies; Descriptive Statistics: measures of central tendency, variability, deviation from normality; chi-square analyses; Charts: creating &editing graphs (Bar; histograms; scatter diagram; percentiles etc.).	**8 Hours**
Unit-4:	**Correlation and regression**: Correlation: Bivariate and Multiplication correlation; correlation matrix; Regression: Simple linear regression; Multiple regression analysis; Factor analysis, Cluster analysis.	**8 Hours**
Unit-5:	**Statistical tests:** Parametric Tests: Means; t-test (Independent samples, paired samples, and one sample tests);One-way ANOVA, two – way ANOVA, Non parametric tests: Mann-Whitney U, Wilcoxon signed-rank.	**8 Hours**
Text Books:	1. Field, Andy. "Discovering Statistics Using SPSS." 3rd Ed., Sage Publishers.	
Reference Books:	1. Cronk, Brian. "How to Use SPSS: A Step-By-Step Guide to Analysis and Interpretation." 5thEd. 2. Kiran Pandya, Smruti Bulsari, Sanjay Sinha, "SPSS in simple steps" Wiley/Dreamtech Press. *** Latest editions of all the suggested books are recommended.**	

Additional electronics reference material:	**https://www.youtube.com/watch?v=fNLeogEjMmM** **https://www.youtube.com/watch?v=06uL9GiY0CQ**	

Course Code: BAS431	**Skill Enhancement Course-II** **B.Sc.(H) Mathematics- Semester-IV** **Statistical Methods**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** the non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.	
CO2.	**Applying** the discrete and continuous probability distributions to various business problems.	
CO3.	**Applying** the Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.	
CO4.	**Applying** the measures of location and measures of dispersion grouped and ungrouped data cases.	
CO5.	**Analyzing** the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test.	
Course Content:		
Unit-1:	Introduction: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Presentation: tabular and graphic, including histogram and ogives.	**8 Hours**
Unit-2:	Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.	**8 Hours**
Unit-3:	Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.	**8 Hours**
Unit-4:	Hypothesis Testing: Types of Hypothesis, level of significance, Critical Region, Power of a test, Types of Error, t-test, z-test, f-test, Chi- Square Test.	**8 Hours**
Unit-5:	Theory of attributes, consistency of data, independence and association of attributes, measures of association and contingency.	**8 Hours**
Text Books:	**1.** Goon A.M., Gupta M.K. and Dasgupta B.: Fundamentals of Statistics, The World Press, Kolkata.	
Reference Books:	**1.** Mood, A.M. Graybill, F.A. and Boes, D.C.: Introduction to the Theory of Statistics, Tata McGraw-Hill Pub. Co. Ltd. *** Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=JG8GRlMjp3c https://www.youtube.com/watch?v=9-sERnyEC0c	

Course Code: BAS- 517	**B.Sc.(H) Mathematics - Semester- V** **Applied Statistics**	**L-5 T-1 P-0 C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understand** the concept of the Statistical Quality control techniques and its applications.	
CO2.	**Applying** the different tools of time series, select the trend equations for the straight and second degree parabola using by least square method.	
CO3.	**Applying** the different formula of index number and time reversal & factor reversal test, find out index of the data and homogeneity error.	
CO4.	**Applying** the vital Statistics find out the C.D.R., S.D.R., C.B.R. and ASFR.	
CO5.	**Analyzing** the methods of measuring seasonal variations, calculate the variation of the various attributes.	
Course Content:		
Unit-1:	Sampling Methods: Population, kinds of population, Sample, Sampling, Simple Random Sampling (SRS): Simple Random Sampling with replacement (SRSWR), Simple Random Sampling without replacement (SRSWOR), Systematic sampling with its problems.	**8 Hours**
Unit-2:	Index numbers: Definition, Criteria for a good index number, different types of index numbers. Construction of index numbers of prices and quantities, consumer price index number. Uses and limitations of index numbers.	**8 Hours**
Unit-3:	Economic Time Series: Components of time series, Decomposition of time series- Additive and multiplicative model with their merits and demerits, Illustrations of time series. Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares (linear, quadratic and modified exponential).	**8 Hours**
Unit-4:	Statistical Quality Control: Introduction of S.Q. C , Uses of S.Q. C, Process control and Product control. Control charts of variable (Mean chart, Range chart, Sigma chart), Control chart of attributes (C – Chart, p – chart, np – chart).	**8 Hours**
Unit-5:	Vital Statistics: Introduction of vital statistics, Uses, Formulation of vital statistics, Crude death rate Specific death rate, Standardized death rate, crude birth rate, fertility rate and Life table.	**8 Hours**
Text Books:	**1.** Mukhopadhyay, P.: Applied Statistics, New Central Book Agency, Calcutta.	
Reference Books:	**1.** Gupta, S. C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons. **2.** Montogomery, D. C.: Introduction to Statistical Quality Control, Wiley India Pvt. Ltd. **3.** Sharma, J. K.: Business Statistics, Pearson Education *** Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=IfExtv06q_M 2. https://www.youtube.com/watch?v=fs4KpMkEUQE	

Course Code: BAS518	B.Sc.(H) Mathematics - Semester- V **Complex Analysis**	L-5 T-1 P-0 C-6
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of analytic function, Harmonic function, singularities, zeroes, poles, singular point, bilinear transformation and conformal mappings.	
CO2.	**Understanding** the basic properties of complex integral and their theorems.	
CO3.	**Applying** the concept of Cauchy's integral theorem, Lioville's theorem, Weirstress theorem and Residue theorem.	
CO4.	**Analyzing** the Residue of a pole at infinity, limiting point of zero's and poles.	
CO5.	**Evaluating** the complex integral of the type $\int_c f(z)dz$, Line integral in the complex plane.	
Course Content:		
Unit-1:	Analytic functions, conjugate function, Harmonic function, Cauchy Riemann equations, construct of analytic function by Milne-Thomson method.	**8 Hours**
Unit-2:	Complex Integration; Complex line integral, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem.	**8 Hours**
Unit-3:	Taylor's and Laurent's series, Singularities, zeroes and poles, singular point and different types of singularities, limiting point of zero's and poles, Weierstrass theorem.	**8 Hours**
Unit-4:	The Calculus of Residue, Residue of a pole at infinity, Residue theorem, evaluation of real integral of the type $\oint_c f(z)dz$.	**8 Hours**
Unit-5:	Conformal mappings, Mobius transformation and its applications.	**8 Hours**
Text Books:	**1.** "Complex Variable" by T Pati, Pothishala Pvt Ltd.	
Reference Books:	**1.** "Complex Variable" by L. V. Alfors, Mc-Graw Hill &Co, **2.** "Complex Variable" by R. K. Gupta, R. V. Churchiland J.W. Browin, Mc-Graw Hill & Co, **3.** Complex Variable by Shanti Narayan, S. Chand &Company. *** Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=b5VUnapu-qs 2. https://www.youtube.com/watch?v=0o98Jz4euW8 3. https://www.youtube.com/watch?v=Mpmlk1H1aQo 4. https://www.youtube.com/watch?v=HoLu9wjuarU	

Course Code: BAS598	B.Sc. (H)-Mathematics- Semester-V **Industrial Training & Presentation**	L-0 T-0 P-6 C-3
Course Procedure:		
	Students will have to undergo industrial training of six weeks in any industry or reputed organization after the II semester examination in summer. The evaluation of this training shall be included in the V semester evaluation. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training. Students will prepare an exhaustive technical report of the training during the V semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college. The student at the end of the V semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned. Not more than three students would form a group for such industrial training/ project submission.	
	The marking shall be as follows.	
Internal: **50 marks**	By the Faculty Guide – 25 marks. By Committee appointed by the Director/Principal – 25 marks.	
External: **50 marks**	By Officer-in-charge trainee in industry – 25 marks. By External examiner appointed by the University – 25 marks	
	Technical report will consist five chapter as per given format:	
Chapter 1:	Brief about organization	
Chapter 2:	Detail of business carried out by organization	
Chapter 3:	Specific contribution during the industrial training (not more than 500 words)	
Chapter 4:	Learning during the industrial training (not more than 200 words)	
Chapter 5:	Conclusion	

Course Code: BGP511	B.Sc.(H) Mathematics- Semester-V **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: **BAS531**	**Discipline Specific Elective Course-I** **B.Sc.(H) Mathematics- Semester-V** **Metric Space**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Euclidean function on R_n.	
CO2.	**Understanding** the definition of continuity for functions from Rn to Rm.	
CO3.	**Applying** the method of convergence for sequences in a metric space.	
CO4.	**Applying** the concepts of compact spaces on the sequences.	
CO5.	**Analyzing** the geometric meaning of each of the metric space properties.	
Course Content:		
Unit-1:	Definition and examples of metric spaces, open spheres and closed spheres, Neighbourhood of a point, Open sets, Interior points, Limit points, Closed sets and closure of a set, Boundary points, diameter of a set, Subspace of a metric space.	**8 Hours**
Unit-2:	Convergent and Cauchy sequences, Complete metric space, Dense subsets and separable spaces, Nowhere dense sets, Continuous functions and their characterizations, Isometry and homeomorphism.	**8 Hours**
Unit-3:	Limit and continuity of a function defined on a metric space, uniform continuity, homeomorphism, Lipschitz continuous function, contraction, isometry, Banach's contraction mapping principle.	**8 Hours**
Unit-4:	Compact spaces, Sequential compactness and Bolzano-Weierstrass property, Finite Intersection property, Continuous functions and compact sets.	**8 Hours**
Unit-5:	Disconnected and connected sets, Components, Continuous functions and connected sets.	**8 Hours**
Text Books:	**1.** G.F. Simmons: Introduction to Topology and Modern Analysis, McGraw Hill.	
Reference Books:	**1.** P.K. Jain and Khalil Ahmad: Metric spaces, Second Edition, Narosa Publishing House, New Delhi. **2.** B. K. Tyagi, first course in metric spaces, Cambridge University Press. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=ZaJpg5PihYc https://www.youtube.com/watch?v=2z7ONxM139o	

Course Code: BAS532	**Discipline Specific Elective Course-I** **B.Sc.(H) Mathematics- Semester-V** **Integral Transform**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of different methods of finding Laplace transforms and Fourier transforms of different functions.	
CO2.	**Applying** properties of special functions by their integral representations and symmetries.	
CO3.	**Applying** Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series.	
CO4.	**Applying** the knowledge of L.T, F.T, and Finite Fourier transforms in finding the solutions of differential equations, initial value problems and boundary value problems.	
CO5.	**Analyzing** Parseval's identity, Plancherel's theorem and applications of Fourier transforms to boundary value problems.	
Course Content:		
Unit-1:	**FOURIER SERIES:** Fourier Series, Theorems, Dirichlet's conditions, Fourier Series for even and odd functions, Half range Fourier series, Other forms of Fourier series	**8 Hours**
Unit-2:	**LAPLACE TRANSFORM:** Definition of Laplace Transform, Linearity property, Piecewise continuous function, Existence of Laplace transform, Functions of exponential order and of class A, First and second shifting theorems of Laplace Transform, Change of scale property, Laplace Transform of derivatives, Initial value problems, Laplace Transform of Integrals, Laplace Transform of Multiplication by T, Laplace Transform of Divison by t, Laplace Transform of periodic functions and error function.	**8 Hours**
Unit-3:	**INVERSE LAPLACE TRANSFORM:** Definition of Inverse Laplace Transform, Linearity property, First and second shifting theorems of Inverse Laplace Transform, Change of scale property, Division by p, Convolution theorem, Heaviside's expansion formula(with proofs and applications).	**8 Hours**
Unit-4:	**FOURIER TRANSFORMS:** FOURIER TRANSFORMS, Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse Theorem for Fourier Transform, Fourier Sine and Cosine transforms and their inversion formula, Linearity property of Fourier transforms, Change of Scale property, Shifting theorem, Modulation theorem, Convolution theorem of Fourier transforms.	**8 Hours**
Unit-5:	**APPLICATIONS OF LAPLACE TRANSFORMS:** Solution of Ordinary Differential Equations with constant and variable coefficients, Solution of Simultaneous Ordinary Differential Equations, Solution of Partial Differential Equations, and Application of Fourier transforms to initial and boundary value problems.	**8 Hours**

Text Books:	**1.** "Integral Transforms" by A.R.Vasistha & Dr. R. K. Gupta Published by Krishna Prakashan Media Pvt. Ltd, Meerut.	
Reference Books:	1. "Operational Mathematics" by R. V. Churchill, Mc Graw Hill Company. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=lkAvgVUvYvY https://www.youtube.com/watch?v=XPMQ3pM-qI4&list=PLhSp9OSVmeyIYLVvSJ8m6KvVwJs7M9QBm	

Course Code: BAS533	**Discipline Specific Elective Course-I** **B.Sc.(H) Mathematics- Semester-V** **Discrete Mathematics**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** basic concept of sets, relation, algebraic structure, Logic gates like countable set, equivalence relation, group, k-maps.	
CO2.	**Understanding** the basic concept of truth table, recurrence relation like tautology contradiction.	
CO3.	**Applying** the concept of relation to find out the equivalence relation, one-one, onto & into.	
CO4.	**Applying** the concept of relation to find out the equivalence relation, one-one, onto & into.	
CO5.	**Applying** the concept of truth table to find out the tautology, contradiction & contingency.	
Course Content:		
Unit-1:	Definition of set, countable and uncountable sets, Venn diagrams, proof of some general identity of sets, relation, types of relation, composition of relation, pictorial representation of relation, equivalence relation, function, types of function, one to one, into and onto function, inverse function, composition of function, mathematical induction (simple and strong).	**8 Hours**
Unit-2:	Introduction to algebraic structure, properties, semi-grouped, monoid, groups, abelian groups, properties of groups, subgroups, cyclic groups.	**8 Hours**
Unit-3:	Posets, hass diagram of posets, isomorphism of ordered sets, well ordered sets, Boolean algebra, SOP and POS form, logic gates, K-maps.	**8 Hours**
Unit-4:	Propositional logic, basic logic operator, truth tables, tautology, contradiction, algebra of proposition, logical implications, logical equivalence, predicates.	**8 Hours**
Unit-5:	Recurrence relations, generating function, graph definition, types of graphs, representation of graphs, isomorphism and homomorphism of graphs.	**8 Hours**
Text Books:	**1.** Discrete mathematics by Vinaya Rawol and bhakti Raul, Techmax publications.	
Reference Books:	**1.** Piskunov N, Differential & Integral Calculus, Moscow Peace Publishers. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**https://www.youtube.com/watch?v=eAaP4XaB8hM** **https://www.youtube.com/watch?v=gtqbcaRMtJw**	

Course Code: BAS535	**Discipline Specific Elective Course-II** **B.Sc.(H) Mathematics- Semester-V** **Dynamics**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the Projectile, impulse, impact and laws of impact.	
CO2.	**Understanding** of the principles of dynamics.	
CO3.	**Analyzing** the dynamics of rigid body.	
CO4.	**Analyzing** the path of a projectile is a parabola.	
CO5.	**Evaluating** the Composition of Simple Harmonic Motion and the differential equation of a central orbit.	
Course Content:		
Unit-1:	**Kinematics in two dimensions**: Velocity, Acceleration, Angular velocity and Relation between Angular velocity and linear velocity, Radial and Transversal velocity and acceleration, Tangential and Normal velocity and acceleration.	**8 Hours**
Unit-2:	**Rectilinear motion:** Motion in a straight line with constant acceleration, Newton's Laws of motion, Simple Harmonic motion, Motion under inverse square law, Motion of the particle under the attraction of the earth, Hook's Law, Horizontal and Vertical elastic String.	**8 Hours**
Unit-3:	**Constrained motion:** Motion of a particle on a smooth and rough vertical plane curve under gravity, Motion along the inside of a vertical circle, Motion after the leaving the circle, Simple Pendulum, Cycloidal Pendulum, Motion along a smooth cycloid.	**8 Hours**
Unit-4:	**Central Forces and Orbit:** Definition of Central force and central orbit, Differential equation of central orbit (Polar and Pedal form), Apse, velocity in a circle, velocity at Infinity, Kepler's laws of planetary motion, and their deductions.	**8 Hours**
Unit-5:	**Moments and Product of Inertia:** Moment of Inertia and Product of Inertia of bodies, Definition of Principle axes, Theorem on parallel axes, theorem of six constant of body, Momental ellipse, Momental ellipsoid, and equimomental system, Motion of rigid body, Effective force, Definition and properties of D'alembert's principle, General Equation of a motion of bodies.	**8 Hours**
Text Books:	1. "A Text book on Dynamics" by S.S. Seth, G.C. Chaddha, Student's Friends & Company.	
Reference Books:	1. "Dynamics" by M. Ray and G. C. Sharma, S. Chand & Company. 2. "Dynamics" by P. K. Mittal and P. K. Shukla, S.J. Prakashan 3. "Dynamics of Rigid body" by M. Ray & G. C. Sharma; Student's Friends & Company. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=ZwuwzE1qAi4 https://www.youtube.com/watch?v=BSvSkSV8Jz8	

Course Code: BAS536	**Discipline Specific Elective Course-II** **B.Sc.(H) Mathematics- Semester-V** **Special Functions**	**L-5 T-1 P-0 C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** special functions of various engineering problem and to known the application of some basic mathematical methods via all these special functions.	
CO2.	**Understanding** the applications and the usefulness of these special functions.	
CO3.	**Understanding** of recurrence formula of the various functions.	
CO4.	**Applying** the functions of different types of differential equations.	
CO5.	**Analyzing** the special function of Legendre & Bessel function.	
Course Content:		
Unit-1:	Preliminaries, Gamma function and related functions, Gauss multiplication theorem, the hyper geometric differential equation, Gauss hyper geometric function.	**8 Hours**
Unit-2:	Integral representation of hyper geometric function, Evaluation of hyper geometric function, the confluent hyper geometric differential equation, Confluent hyper geometric function.	**8 Hours**
Unit-3:	Bessel's equation, solution of Bessel's equation, Bessel's functions $J_n(x)$, Recurrence Formulae, Equations reducible to Bessel's equation, orthogonality of Bessel's Functions, A generating function for $J_n(x)$, Basic properties.	**8 Hours**
Unit-4:	Legendre's equation, Legendre's polynomial $P_n(x)$, Legendre's function of the second kind $Q_n(x)$, General solution of Legendre's equation, Rodrigue's formula, Legendre polynomials, A generating function of Legendre's polynomial , Orthogonality of Legendre polynomials, Recurrence formulae for $P_n(x)$.	**8 Hours**
Unit-5:	Hermite's equation and its solution, Hermite polynomial of order n, Generating function, orthogonal property, Recurrence relations	**8 Hours**
Text & Reference Books:	1. W.W. Bell: Special Function for Scientists and Engineers, Dever publications. 2. U.P. Singh: Special Function &Their application, Wisdom Press. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=q-crw2sq4eM&list=PL5Xv9SnZb7Hf3uRZA_sOfFN8ZKGYaBEgo https://www.youtube.com/watch?v=MGLgDlE_uaU	

Course Code: BAS619	**B.Sc.(H) Mathematics- Semester-VI** **Graph Theory**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the origin of Graph Theory.	
CO2.	**Understanding** the independent sets and covering sets and some basic theorems.	
CO3.	**Understanding** the basic properties of directed graphs.	
CO4.	**Applying** connectedness and components and some theorems.	
CO5.	**Applying** the Characteristics of tree.	
Course Content:		
Unit-1:	Definition of Graph and their properties, types of graph, homomorphism, isomorphism, automorphism of graph, subgraph, Walk, trail and path, connected and disconnected graph Eular's Graph, Operation on graph.	**8 Hours**
Unit-2:	Definition of Trees, Pendent vertex, center of a tree, binary tree, spanning tree, Fundamental Circuits, Connectivity and separability, preorder and post order.	**8 Hours**
Unit-3:	Planar and dual graphs, Kuratowski's two graphs, different representations of planer graphs, detection of planarity, Geometric dual, Combinatorial dual, Thickness and Crossing.	**8 Hours**
Unit-4:	Vectors and vector spaces, Vector space associated with a graph, Basis vectors of a graph, circuit and cut-set subspace, Orthogonal vectors and spaces, Intersection and join of v and vs.	**8 Hours**
Unit-5:	Matrix representation of graphs, Incidence matrix, Sub matrix of $A(G)$, Circuit matrix, Fundamental circuit matrix and Rank of B , Cut-set matrix, Path matrix, Adjacency Matrix.	**8 Hours**
Text Books:	**1.** "Graph Theory" by Narsingh Deo, Printice Hall of India.	
Reference Books:	**1.** "Graph Theory" by S.B. Singh, Khanna book Publishing co. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=HfYpiD1nbsw https://www.youtube.com/watch?v=1XlT3Y2oyAU	

Course Code: BAS698	B.Sc.(H) Mathematics- Semester-VI **Project**	L-0 T-0 P-16 C-08

For students to enter into preliminary research field both in theory and experiment the concept of Seminar, Presentation & Viva has been introduced in the final Semester. In this report, student will explore new developments from the books and journals, collecting literature / data and prepare the report in form of power point presentation based on his / her work and studies, and submit in concern department.

General guidelines are as follows-

1. Students will make seminar report which should be preferably a working of third thoughts based on their subject.
2. The student will be assigned a faculty guide who will be the supervisor of the students. The faculty would be identified at the end of the Vth semester.
3. Internal assessment of the students should be done at least twice in the semester.
4. The students shall present the final presentation live using overhead projector PowerPoint presentation on LCD to the internal committee and the external examiner.
5. The internal evaluation committee shall consist of faculty members constituted by the college which would be comprised of at least three members comprising of the department Coordinator's, Class Coordinator and a nominee of the Director/Principal. The students guide would be special in invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each members of the committee.

The Marking shall be as follows.

Internal: 50 marks
By the Faculty Guide – 25 marks
By Committee appointed by the Director/Principal – 25 marks

External: 50 marks
By External examiner appointed by the University – 50

Note: Project will be prepared as per approved project template which included the entire guidelines & format related project.

EVALUATION SHEET

(To be filled by the GUIDE & Internal Examiners only)

Name of Candidate:
Roll No:

Class and Section:

Please evaluate out of five marks each.

S. No.	Details	Marks (5) Guide	Marks (5) Int. Exam. 1	Marks (5) Int. Exam. 2
1.	Objective Identified &Understood			
2.	Literature Review / Background Work (Coverage, Organization, Critical Review)			
3.	Discussion/Conclusions (Clarity, Exhaustive)			
4.	Slides/Presentation Submitted (Readable, Adequate)			
5.	Frequency Of Interaction (Timely Submission, Interest Shown, Depth, Attitude)			
	Total (Out of 25)			
	Average out of 50			

Signature: Signature: Signature:
Date: Date: Date:

EVALUATION SHEET FOR EXTERNAL EXAMINER

(To be filled by the External Examiner only)

Name of Candidate:

Roll No:

I. For use by **External Examiner ONLY**

S. No.	Details	Marks (10) each
1.	Objective Identified & Understood	
2.	Literature Review / Background Work (Coverage, Organization, Critical Review)	
3.	Discussion/Conclusions (Clarity, Exhaustive)	
4.	Power Point Presentation (Clear, Structured)	
5.	Slides (Readable, Adequate)	
	Total (Out of 50)	

Signature:

Date:

Course Code: BGP611	B.Sc.(H) Mathematics- Semester-VI **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: BAS616	Discipline Specific Elective Course-III B.Sc.(H) Mathematics- Semester-VI **Fourier & Laplace Transform**	L-5 T-1 P-0 C-6
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series.	
CO2.	**Understanding** about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties	
CO3.	**Understanding** the concepts of different methods of finding Laplace transforms and Fourier transforms of different functions.	
CO4.	**Applying** Parseval's identity, Plancherel's theorem and applications of Fourier transforms to boundary value problems.	
CO5.	**Analyzing** the ordinary differential equations using Laplace transforms	
Course Content:		
Unit-1:	**Laplace Transform:** Definition of Laplace Transform, Linearity property - Piecewise continuous function, Existence of Laplace transform, First and second shifting theorems of Laplace transform, Change of scale property, Laplace transform of derivatives, Initial value problems, Laplace transform of Integrals, Laplace transform of Multiplication by t, Laplace transform of Divison by t, Laplace transform of periodic functions and error function.	**8 Hours**
Unit-2:	**Inverse Laplace Transform:** Inverse Laplace Transform, Linearity property, First and second shifting theorems of Inverse L.T., Change of scale property, Division by p, Convolution theorem, Heaviside's expansion formula, Solution of Ordinary Differential Equations with constant coefficients by L.T., Solution of Simultaneous Ordinary Differential Equations.	**8 Hours**
Unit-3:	**Fourier Series**: Fourier Series, Dirichlet's conditions Fourier Series for even and odd functions, Determination of Fourier coefficients Periodic functions, Orthogonality of sine and cosine functions, Half range Fourier series Other forms of Fourier series, Parseval's theorem.	**8 Hours**
Unit-4:	**Fourier Transforms**: Fourier Integral and Fourier transform, Properties of Fourier transform, Fourier complex transformation and it's properties, Fourier sine and cosine transformations and application to simple heat transfer equation.	**8 Hours**
Unit-5:	**Fourier Inverse Transforms:** Fourier transform Inverse Theorem for Fourier Transform Fourier Sine and Cosine transforms and their inversion formula, Linearity property of Fourier transforms, Change of Scale property, shifting theorem, Modulation theorem, Convolution theorem of Fourier transforms, Parseval's identity, Solution of Partial Differential Equations Applications of Fourier transforms to initial and boundary value problems.	**8 Hours**

Text Books:	**1.** A. R. Vasistha & Dr. R. K. Gupta, Integral Transforms, Published by Krishna Prakashan Media Pvt. Ltd, Meerut.	
Reference Books:	**1.** Shanthi Narayan and P. K. Mittal, A Course of Mathematical Analysis S. Chand & Co., New Delhi. **2.** R. V. Churchill, Operational Mathematics, Mc Graw Hill Company. *** Latest editions of all the suggested books are recommended**	
Additional electronics reference material:	**https://www.youtube.com/watch?v=EDVJotmT584** **https://www.youtube.com/watch?v=GtXmS5YH7XM**	

Course Code: **BAS632**	**Discipline Specific Elective Course-III** **B.Sc.(H) Mathematics- Semester-VI** **Theory of Probability**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of the probability, addition law of probability and multiplication law of probability with its applications.	
CO2.	**Applying** the concept of discrete and continuous random variable to calculate the moment and generating functions.	
CO3.	**Analyzing** the concept of mathematical expectation, addition and multiplication theorem of Expectation.	
CO4.	**Analyzing** the M.G.F, C.F and P.D.F of the discrete and continuous distributions.	
CO5.	**Evaluating** the concept of Probability distributions and its recurrence relation of the distribution.	
Course Content:		
Unit-1:	Probability: Introduction, sample space, events and algebra of events, Kinds of Probability: classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events.	**8 Hours**
Unit-2:	Random Variables: Discrete and continuous random variables, p.m.f, p.d.f, c.d.f. Illustrations of random variables and its properties, variance, moments and moment generating function.	**8 Hours**
Unit-3:	Mathematical Expectation- Expectation of a Random Variable, Addition & Multiplication Theorem of Expectation, Moments-Moment Generating Function, Limitations of m.g.f, cumulants - additive property.	**8 Hours**
Unit-4:	Discrete probability distributions: Bernoulli distribution : M.G.F, C.F , mean and variance, Binomial distribution : M.G.F, C.F , P,D.F, mean and variance, Poisson distribution: M.G.F, C.F , P,D.F, mean and variance.	**8 Hours**
Unit-5:	Continuous Probability Distributions: Gamma Distribution : M.G.F, C.F , P,D.F, mean and variance, Beta distribution: M.G.F, C.F , P,D.F, mean and variance, and Uniform distribution: M.G.F, C.F , P,D.F, mean and variance,	**8 Hours**
Text Books:	**1.** Mathematical Statistics" by S.C. Gupta, S. Chand & co.	
Reference Books:	**1.** Miller, Irwin and Miller, Marylees : John E. Freund's Mathematical Statistics with Applications, Pearson Education, Asia. **2.** Myer, P.L.: Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi. ***Latest editions of all the suggested books are recommended**	
Additional electronics reference material:	https://www.youtube.com/watch?v=SkV6ptyG_Jg https://www.youtube.com/watch?v=H2Ji-Q4MfqU	

Course Code: **BAS633**	**Discipline Specific Elective Course-III** **B.Sc.(H) Mathematics- Semester-VI** **Differential Geometry and Tensor**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of space curves, fundamental vectors and fundamental planes and their mathematical expressions in n dimensions.	
CO2.	**Understanding** the concept of surfaces and fundamental forms/metric and relations among them.	
CO3.	**Understanding** the concept of envelope and ruled surfaces: developable and skew surface, and derive the necessary and sufficient conditions for a surface to be ruled surface.	
CO4.	**Understanding** of the tensor notations and their algebra, contravariant and covariant tensors and their law of transformation.	
CO5.	**Understanding** of Christoffel symbols and their tensor law of transformation.	
Course Content:		
Unit-1:	Curves in space, space curves, are lengths, tangent plane lines, osculating plane, normal plane, unit vectors t, n, b, serret fernet formula, curvature and torsion of curves helix, osculating circle and osculation sphere.	**8 Hours**
Unit-2:	Fundamentals of surfaces, definition of surface, class of a surface, regular and singular point, tangent and normal planes, fundamental form and relation between E, F, G, Fundamental magnitude of standard surface.	**8 Hours**
Unit-3:	Envelopes and Developable surfaces, characteristics envelop, edge of regression, developable surface, envelops of a plane etc.	**8 Hours**
Unit-4:	Tensor definition ; Law of Transformation; Contravariant And covariant Tensor; Mixed tensor; rank of Tensor; outer and inner product; Algebra of tensor; Associated vector; Quotient law.	**8 Hours**
Unit-5:	Christoffel symbols; comma notation; Riemannian christoffel symbols, Bainchy Identity; Ricci tensor; covariant derivative of contarvarient tensor, Covariant derivative of covariant tensor.	**8 Hours**
Text Books:	**1.** "Differential Geometry" by A. R. Vasistha and J. N. Sharma, Kedarnath Ramnath.	
Reference Books:	**1.** "Differential Geometry" by A.B. Chandra Moule and J. B. Chauhan, SikshaSahitya Prakashan. **2.** "Differential Geometry" by P. P. Gupta and G. S. Malik, Pragati Prakashan. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	https://www.youtube.com/watch?v=uaQeXi4E7gA https://www.youtube.com/watch?v=geKDt71p3JU	

Course Code: **BAS634**	**Discipline Specific Elective Course-IV** **B.Sc.(H) Mathematics- Semester-VI** **Number Theory**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the fundamental properties of numbers and their various representations in number system.	
CO2.	**Understanding** the concepts of division algorithm, greatest common divisor, least common multiple and Bracket functions.	
CO3.	**Understanding** the concept of congruence and solution approach of the Diophantine equations.	
CO4.	**Understanding** the milestone theorems on number theory.	
CO5.	**Applying** the prime numbers using the concepts of Fermat numbers, Mersenne numbers.	
Course Content:		
Unit-1:	Unit, Primes, Composite numbers and Co-prime integers, Division Algorithms, Greatest Common divisor, Induction Method, Fundamental Theorem of Arithmetic, Standard Form, Least Common Multiple, Bracket Function.	**8 Hours**
Unit-2:	Congruence, Equivalence Relation, Linear Congruence and their theorems.	**8 Hours**
Unit-3:	Fermat Theorem, Fermat's factorization Method, Fermat's little theorem, Wilson Theorem, Euler's factorization Method.	**8 Hours**
Unit-4:	Euler's Function, Mobius function, Euler's theorem, Some properties of Euler's functions.	**8 Hours**
Unit-5:	Perfect Numbers, Mersenne primes, Fermat number, Pythagorean triples, Lagrange's theorem**.**	**8 Hours**
Text Books:	**1.** Davis M. Burton, Elementary Number Theory, USB.	
Reference Books:	**1.** U. Dudley, Elementary Number Theory, Freeman & Co. **2.** George Andrews, Number Theory, Courier Dover Publications. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**https://www.youtube.com/watch?v=M5TT-XnpsY0** **https://www.youtube.com/watch?v=0uRL3ymzWig**	

Course Code: BAS631	**Discipline Specific Elective Course-IV** **B.Sc.(H) Mathematics- Semester-VI** **Mathematical Modeling**	**L-5** **T-1** **P-0** **C-6**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the various mathematical models.	
CO2.	**Understanding** the basic properties of graphs.	
CO3.	**Understanding** the concepts of vector & vector spaces.	
CO4.	**Analyzing** the analytic and numerical models.	
CO5.	**Analyzing** the value of model results discussed in various sources and in scientific and mathematical literature.	
Course Content:		
Unit-1:	Definition of Graph and their properties, types of graph, homomorphism, isomorphism, automorphism of graph, subgraph, Walk, trail and path, connected and disconnected graph Eular's Graph, Operation on graph.	**8 Hours**
Unit-2:	Definition of Trees, Pendent vertex, center of a tree, binary tree, spaning tree, Fundamental Circuits, Connectivity and separability, preorder and post order.	**8 Hours**
Unit-3:	Planar and dual graphs, Kuratowski's two graphs, different representations of planer graphs, detection of planarity, Geometric dual, Combinatorial dual, Thickness and Crossing.	**8 Hours**
Unit-4:	Vectors and vector spaces, Vector space associated with a graph, Basis vectors of a graph, circuit and cut-set subspace, Orthogonal vectors and spaces, Intersection and join of W and W_s.	**8 Hours**
Unit-5:	Matrix representation of graphs, Incidence matrix, Sub matrix of $A(G)$, Circuit matrix, Fundamental circuit matrix and Rank of B, Cut-set matrix, Path matrix, Adjacency Matrix.	**8 Hours**
Text Books:	1. "Graph Theory" by Narsingh Deo, Printice Hall of India	
Reference Books:	1. "Graph Theory" by S.B. Singh, Khanna book Publishing co. ***Latest editions of all the suggested books are recommended**	
Additional electronics reference material:	https://www.youtube.com/watch?v=br7tS1t2SFE https://www.youtube.com/watch?v=1h2BoCtobXw	