Manav Rachna University, Faridabad
(formerly Manav Rachna College of Engineering)

MINUTES OF THE
TENTH MEETING OF THE
ACADEMIC COUNCIL

Dated: April 22, 2019

MINUTES OF TENTH MEETING OF THE ACADEMIC COUNCIL OF MANAV RACHNA UNIVERSITY HELD ON MONDAY, DATED 22.04.2019 AT 11:00 AM IN THE BOARD ROOM A-BLOCK, MRU, SECTOR 43, DELHI SURAJKUND ROAD, FARIDABAD.

A meeting of the Academic Council was held on Monday, Dated 22.04.2019 in the Board Room, A- Block, MR Campus, Faridabad.

The following were present:

1) Prof. (Dr.) I.K. Bhat, Hon'ble Vice Chancellor / Chairman
2) Prof. (Dr.) Kanupriya Sachdeva, Professor, MNIT, Jaipur.
3) Prof. (Dr.) Anita Rastogi, Professor, JMI, New Delhi.
4) Prof. (Dr.) Devender Kumar, Professor, Delhi Technological University, Delhi.
5) Dr. Pilli Emmmanuel Shubhakar, Associate Professor, MNIT, Jaipur
6) Prof. (Dr.) Sangeeta Banga, Dean,Academics
7) Prof. (Dr.) Shruti Vashisht, Dean, Students Welfare & HoD, ECE.
8) Prof. (Dr.) B.M. Bahal, Dean, Applied Sciences
9) Prof (Dr.) Pradeep Kumar Varshney, Dean, Research
10) Dr. Babita Parashar, Dean, Education
11) Shri. Jaideep Singh, Director, Industry Interaction
12) Prof. (Dr) Jose P. Varghese, Professor Emeritus, Dept. Of Law
13) Ms. Hanu Bhardwaj, HoD, Computer Science & Engineering
14) Prof. (Dr.) Sujata Nayak, HoD, Mechanical Engg.
15) Prof. (Dr.) Haider Abbas, HOD, Physics
16) Dr. Megha Mittal, HOD, Chemistry
17) Dr. Rashee Singh, HoD, Education.
18) Dr. Parneeta Dhaliwal, HoD, Mathematics
19) Prof. (Dr.) Versha Vahini, HoD, Law
20) Prof. (Dr.) A. K Gupta, Professor, Chemistry
21) Prof. (Dr.) D.K. Sharma, Professor, Physics
22) Prof. (Dr). Sushmita Ray, Professor, CSE
23) Dr. Pragati Chauhan, Assoc. Professor, Management
24) Ms. Meena Kapahi, Assoc. Professor, Chemistry
25) Dr. Jyoti Pruthi, Assoc. Professor, CSE.
26) Dr. Jai Prakash, Assoc. Professor, Physics
27) Dr. K.Singh, Registrar/Member Secretary

Dr. S.K. Goel, Executive Director, Star wires (India) Ltd. Faridabad. Prof.(Dr.) S. K. Garg, Pro Vice Chancellor, Delhi Technological University, Delhi , Prof. (Dr).Reetesh Kumar Singh, Professor, Dept. of Com., Delhi School of Economics, Prof.(Dr.)Raj Senani, Professor Emeritus, Netaji Subhash University of Technology, Prof.(Dr.)G.S. Bajpayee, Professor & Registrar, National Law University, Delhi, Shri Ajay Kabra, Sr.

Director - Agile Transformation, Xebia India, Shri Pradeep Kumar, Head-Channel Sales, Altair Engineering and Prof. (Dr.) Parul Jhajharia, Dean, Management could not attend the meeting due to their pre-occupation in other professional engagements. They were granted leave of absence by the Chair.

The following are the minutes of the meeting:

Registrar welcomed the Members present in the meeting and apprised that the Council has been reconstituted and some new members nominated to it. It has now representation of members from the disciplines of Physics, Chemistry, Mathematics, Computer Science & Engineering and Electronics and Communication Engineering in addition to members from Industries. He further said that Prof. I K Bhat, who assumed the Charge of the Office of Vice Chancellor on February 01, 2019 will be chairing the meeting of Academic Council of MRU for the first time and voiced that with academic acumen and vast administrative experience he carries with him, MRU would be able to attain new heights under his able leadership and guidance. Registrar also expressed his deep gratitude and appreciation towards Prof. Dr. Sanjay Srivastava, Ex Vice Chancellor of the University for his guidance, motivation, direction and support provided to one and all during his four years of tenure as Vice Chancellor.

Registrar then, read brief profile of new members namely, Prof. (Dr.) Anita Rastogi, Professor, JMI, New Delhi.,Prof. Pilli Emmanuel Shubhakar, Associate Professor, MNIT, Jaipur, Prof. Kanupriya Sachdeva, Professor, MNIT, Jaipur and Prof. Devender Kumar, Professor, Delhi Technological University, Delhi who were present in the meeting for information of other members and requested the Vice Chancellor to open the meeting with his remarks.

10.1 Opening Remarks by the Chairman

Vice Chancellor in his opening remarks suggested that any such meeting should be started with National Anthem, which was accepted and all the members of the Council sung the National Anthem. The Vice Chancellor then greeted the members present in the meeting. He extended special welcome to the new members and said, with the versatile knowledge and experience which they possess with them, the Council would be further strengthened. He thanked the outgoing Vice Chancellor Prof. Sanjay Srivastava for the efforts put forth by him right from its inception to bring the University up to this level. He also thanked other outgoing members of the Council for their valuable contribution in growth and development of the University.

The Chairman then informed about the MRNAT Examination 2019 which was conducted on 19.03.2019 successfully on campus and outside in 10 different locations in different States of the country and said that the response of the candidates this time was better in comparison to last year.

He apprised that this year, University received a good response for admissions to Ph.D. program. 31 candidates have been admitted in the program during the current academic session, 2018-19. The classes for the Course work have already been started w.e.f. 02.02.2019 after Havan ceremony which is a practice established by our Founder Visionary Dr. O.P. Bhalla ji and solemnized before starting any program in the new academic session.

The Chairman, further mentioned that a three days Faculty Development Program on Teaching Pedagogies was conducted for Deans & HoDs of the university during the period from 13th to 15th March, 2019. Further, two FDPs for the faculty members of MRIIRS was also conducted on Outcome Based Education and Blooms Taxonomy & Quality Question papers in the month of April. It will help MRIIRS prepare themselves for ABET accreditation.

He further mentioned that, in the Choice Based Credit System, policy is to frame the program structure and syllabus in such a way that it should have 60% core component and 40 % electives so that students should have more choice to choose the electives from different areas. This would help the students in developing lots of innovative ideas and work in the area of his passion. He requested all the Deans and HoDs to reduce the contract hours of time table so that students have an opportunity to utilize Library, Innovative Centre, Sports, ED Cell and also make it possible for them to represent University at various platforms. He informed the members that curriculum which is in preparation contains subjects like AL, ML, Robotics, NT, Mechatronics etc. to take care of digital disruptions. Such an approach is expected to make our students more employable and will help in removing economic, social and digital divides. He also informed members about the activities and wards received by faculty and students since last Academic Council meeting.

He further drew attention of the Heads of the Departments and Deans towards the R & D projects and requested that they should submit more Projects for Grant-in- Aid to make Ph.D. program more effective as research is an important component these days for the Universities for ranking, accreditation etc.

He also mentioned that budget has been allocated for the Depts. for the ensuing academic year as per the request of the departments. He suggested that every department should conduct at least one conference and submit their proposals to Deans for coordination in the matter.

Chairman also apprised the members that university would be entering into a MOU with M/s Altair Engineering, Inc. which is a leading provider of enterprise product development and concept design solutions to manufacturing companies worldwide Innovative products and services for setting up a Centre of Excellence (COE) in the University, which would provide access to 30 users at a time. This would be immensely beneficial to the students as well as faculty of the Department of Mechanical

Engineering, Civil Engineering, Aeronautical Engineering, besides Electronics and Communication Engineering. With these words he concluded his remarks and requested Registrar to take up the Agenda meant for today's deliberation. The Registrar took up the Agenda one by one for deliberation as under.

10.2 Confirmation of the Minutes of the Ninth Meeting of the Academic Council held on 07.12.2018.

Hon'ble Members of the Council were informed that Minutes of the Ninth Meeting of the Council, held on 07.12.2018, were circulated to all the members vide email dated 11.12. 2018. Prof. Rajat Gera, Ex. HoD, Mgt. & Commerce, had requested that:

i) HoD, Department of Mgt. & Commerce be also written alongwith his name.
ii) Honble Vice Chancellor also appreciated the hard work, dedication and international achievements in research made by Prof. Gera.

The Council took note of the above remarks and agreed to incorporate the above as part of the last para of the opening remarks of the Ninth Meeting and confirmed the Minutes.

Decision: Academic Council approved the Minutes of the Ninth Meeting with incorporation of the remarks of Ex HoD, Management.

10.3 Action Taken Report on the decisions taken in the Ninth Meeting of the Academic Council.

The Council was apprised with the action taken on the decisions, which were made in the last meeting of Academic Council on the agendas below and requested to permit the same for taking on record.

Sl. No.	Agenda	Decisions	Action Taken thereon
1.	Opening remarks by the Chairman	-	No action required
2	Confirmation of the Minutes of the Eighth meeting of the Academic Council held on **28.09. 2018**	Academic Council confirmed the Minutes of the last meeting.	Actions were taken as per approved Minutes of the Council

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3	Action Taken Report on the decisions taken in the Eighth meeting of the Academic Council.	Academic Council took the Action Taken Report on record.	-
4	Matter for information (i) Achievements by the Faculty and Students (ii) Conferment of Honoris causa,Doctorate of Philosophy during the Second Convocation to be held in the December, 2018.	Academic Council took the above information on record.	The recommendation of the Academic Council which was endorsed by the Governing Body was submitted the Hon'ble Visitor for approval. As per the provision of the First Statutes, approval of the Hon'ble Visitor was obtained vide letter no. HRB-UA-39(5)-2008/8560 dated-14.12.2018
5	Matter for Ratification Massive Open Online Courses (MOOCs) offered by the Academic Departments	Academic Council ratified the MOOCs being offered by the University during 2018-19	No action required
6	Approval of Admissions made after 27.9.2018 under UG/PG programs during the academic session 2018-19.	Academic Council approved the admissions made in the session 2018-19.	No action required
7	Amendment in Manav Rachna University (Third) Regulation, 2017 in light of the UGC (Promotion of Academic Integrity and Prevention of Plagiarism in HEIs) Regulations 2018.	Academic Council approved the Manav Rachna University Plagiarism Policy (First Amendment) 2018 for submission to the Board.	The regulation was placed before the Board which after deliberation over it approved the same. Approved Regulation was circulated among the faculty/Depts for information and implementation.

8	Conferment of Degrees to UG/PG Students Pass out in the year 2018.	Academic Council approved the conferment of Degrees to 36 students pass out in 2018.	All the thirty six graduands were conferred degree during Second Convocation held on 19.03.2019
9	Amendment in Chapters 3 & 4 of the First Ordinance in light of the AICTE New Model Guidelines.	Academic Council approved the amendments proposed in the First Ordinance for submission to Board of Management for their approval.	The amendments recommended by the Academic Council were placed before the BOM for consideration. Board approved the same.
12	Any other matter with the permission of Chair a) Financial assistance to the faculty Members for attending the International Conferences /Talks	Faculty members may apply with AICTE/ DST for travelling grant, which is available to the faculty members of Engineering and Applied Sciences. As far as financial support for international conference by the University, the Administration, will take up the issue with the Finance Committee and Board of Management for consideration.	A Committee has been constituted under the Chairpersonship of the Dean, Academic for framing the norms and guidelines for the purpose. The recommendation of the Committee shall be placed before the Finance Committee and the other statutory bodies for their consideration.

Decision: Academic Council took the Action Taken Report on record.

10.4 Matters for Information

Academic Council was apprised on the following:

(a) Receipt of NOC from State Govt. for starting new UG/PG Programs from the Academic Session 2019-20.

(b) Conferment of Honoris Causa, Doctorate of Philosophy

(c) Achievements by the Faculty & Students

(d) Organizing of Second Convocation on March 19, 2019.

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(e) Collaboration with institutions engaged in commercial ADR/ Arbitration

(f) Internship Policy for Law Interns of MRU

Decision: Academic Council took the above information on record.

10.5 Matter of ratification

(a) Establishment of Centre of excellence for Alternative Dispute Resolution

Academic Council was informed that the Faculty of Law had proposed to set up a Centre of Excellence on ADR in the premises of our University to support academic pursuit in the field of ADR with emphasis on intensive research, training and conduct of cases of Arbitration and Mediation by simulative exercises.The Centre will also give additional impetus to the specialized LLM Program. This proposal was considered in the Meeting of Advisory Board of the Law held on 01.12.2018 and approved with the following mandate:

1. The Centre shall be named as Manav Rachna Centre for Alternative Dispute Resolution. (MR-CADR)
2. Centre shall operate under the aegis as a functional unit attached to the faculty of law.
3. Centre shall be autonomous, to the extent, to propose, decide and undertake projects, research/training and conduct of cases of Arbitration and Mediation within ambit of its mandate.

The objective, organizational structure and functions of the Centre shall be as given below:

A. Objective

The Centre shall have the following objectives –
1. To support the academic pursuits of the Faculty of Law, with research and practical training in the field of ADR;
2. To undertake research on its own for the purpose of bringing out publications;
3. To train, develop and cultivate core group of ADR experts in India, capable of employing alternative resolution mechanisms, to the disputes of national and international nature;
4. To provide an effective forum for exchange and analysis of ideas and information between industry, professionals, trade associations, government agencies and academia;
5. To enable the research activities of Centre to become eligible for projects from the Government, or from any other agencies;
6. To explore the national and international collaborations and tie ups to facilitate the activities of the Centre such as KDLC,SIAC, SIMC etc.

B. Organizational Structure

The organizational structure of the centre shall have the following:

1. Director : shall be a person having expertise in the field of ADR and/ or law. who shall lead the vision, mission and activities of the Centre,
2. Panel of Experts, Trainers
3. Research Staff, including 2 Research Associates
4. Office Assistant
5. The Centre of Excellence shall have Advisory Board and other facilities befitting a first class centre of excellence.

C. Functions

The functions of the Centre shall be:

1. To conduct research in identified areas and publish papers
2. To undertake institutional Research Projects
3. To take up external consultations and advisory projects
4. To conduct other outreach programmes for Awareness and Sensitization in the form of Workshops, seminars, Guest lectures, Roundtables, Conferences on various areas relating to ADR
5. To conduct Diploma and Certificate Programs& other training programs in the fields of ADRs
6. To enter into Tie ups and collaborations with domestic and international partners.
7. To build functional and professional linkages with Industry, professionals, government agencies and other organizations within and outside India.
8. To facilitate Post Graduate Law students of MRU into research in ADR mechanisms
9. To enable Post Graduate Law students to experience and learn from the proceedings conducted in real and through simulation
10. To create and update the website, exclusive on ADRs with data base relating to relevant laws, cases, case studies and other pertinent information, deemed fit by the Centre of Excellence

It was also informed that the establishment of the centre of excellence on ADR has already been notified by the University on 02.02.2019, with the approval of the Hon'ble Chancellor. The members after deliberation ratified the action taken by the University.

Decision: Academic Council ratified the establishment of Centre of Excellence for Alternative Dispute Resolution by the University

10.6 Approval of Program structure and syllabus for LL.M (one Year) and Ph.D. Course work

It was informed that the Dept. of Law proposes to offer LLM (One Year) Program with specialization in any two areas, out of three specified by UGC, depending upon the choices made by the students. The three specializations include

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Corporate Law; Commercial Arbitration and Constitutional Law. The minimum credit required for award of degree for the above program (Regular/ Part Time) shall be 25. The program will be offered in Choice Based Credit System

In Ph.D. program of MRU, two subjects are offered for the course work, namely Research Methodology and Quantitative Techniques, **4 credits each**. Faculty of law proposes to substitute Quantitative techniques with two subjects namely, Comparative Constitutional Law and International Commercial Arbitration, 2 credits each. The substitution is proposed in view of the fact that legal research is largely qualitative and doctrinal in nature containing analysis of concepts, theories and relevant laws.

The program structures and syllabus of LLM (One year-Regular) and Course work of Ph.D. Programs, were considered by the Academic Council and approved.

Decision: Academic council approved the Program Structure and Syllabus of Ph.D. (Course work) and LL.M Programs to be offered from Academic Session 2019-20.

10.7 Approval of Program Structure and Syllabus of 3rd and 4th Semester of BA LLB (5 Years), BBA LLB (5 Years) & B.Com LLB (5 Years) Program.

Academic Council considered the Program Structure and Syllabus of 3rd and 4th Semester for the above programs and observed that approval should have been obtained by the Department prior to commencement of the Semesters rather than seeking approval when the 4th Semester is almost on the verge of ending. Since, the syllabus and schemes are already adopted and exam conducted, it is a matter for ratification. The Council advised that the Department should take a note of it and come for approval of the same for the remaining six semesters i.e. 5th to 10th Semester well in advance of the commencement of the Semester. HoD assured to do the needful in the matter.

Decision: Academic council ratified the Program Structure and Syllabus of 3rd and 4th Semester of BA LLB (5 Years), BBA LLB (5 Years) & B.Com LLB (5 Years) Programs with the advice that Department shall submit the Program Structure, Scheme of Examination and Syllabus for the remaining Semester 5th to 10th together in the next meeting of the Council.

10.8 Approval of revised program structure of B.Sc. (Hons) and M.Sc. in Physics, Chemistry and Mathematics.

i) Revision of Program structure of B.Sc. (Hons) Physics and M.Sc. Physics

The proposal of the Department of Physics for revision in Program Structure of B.Sc (Hons) and M.Sc. Physics and reducing total credit from **141 to 112** in B.Sc.(H) Physics and **88 to 74.5** in M.Sc.(Physics) to maintain uniformity with the model curriculum provided by UGC was considered by the Council. Hon'ble members were apprised that the proposed revision in the program structure would provide more time to students for self study, exploration, involvement in research work and also help them for getting into multidisciplinary areas of socio-scientific communities. Similarly, revision in the program structure of M.Sc. Physics will make the curriculum more suitable for competitive exams like NET/GATE/JRF. It was also informed that Total Credit required for award of degree of B.Sc. (H) Physics shall range between 105 and 115 whereas for M.Sc. (Physics) it shall range between 70 and 80.

ii) Revision of Program structure of B.Sc, (Hons) Chemistry and M.Sc. Chemistry

The Dept. of Chemistry apprised the Council that revision in the program structure for B.Sc.(Hons) and M.Sc. Chemistry has been taken up keeping into consideration the model curriculum suggested by the UGC under CBCS with upper credit limit of 140 for B.Sc. (H) Chemistry and 84 credits for M.Sc. Accordingly, it is proposed to reduce the total Credit from **198 to 117** for B.Sc. (H) Chemistry and from **98 to 74 for M.Sc. (Chemistry)**. It is also proposed that all the hard courses in B.Sc. (H) Chemistry are of 4 credits either as 3-1-0-0 mode or 3-0-0-1 mode. Lab courses are of 1 or 1.5 credits as 0-0-2-0 or 0-0-3-0 mode. Soft courses are of 2 credits either as 1-0-2-0, 1-1-0-0 or 2-0-0-0 mode. In odd and even semester, one basket of skill enhancement will be offered and Student can opt any course out of it. One component of this basket is Minor Project as well. In M.Sc. all three specializations will be offered as Physical, Organic and Inorganic in semester III. The proposed revision in the program structure will help students to get sufficient time to focus on self study, projects, and preparation for competitive exams. Total Credit required for award of the degree of B.Sc. (H) Chemistry shall range between 110 and 125 whereas for M.Sc. Chemistry, it shall range between 70 and 80.

iii) Revision of Program structure of B.Sc. (H) Mathematics and M.Sc. Maths.

Dept. of Mathematics apprised that the revision in the Program Structure for B.Sc. (H) Mathematics and M.Sc. Mathematics has been taken up keeping into consideration the model curriculum suggested by the UGC under CBCS with upper credit limit. In the revised one, total number of Program credits has been reduced from 150 to 122 for B.Sc (H) Mathematics and from 89.5 to 77.5 credits

for M.Sc. Total Credit required for award of Degree of B.Sc (H) Mathematics shall range between 115 and 125 whereas for M.Sc. (Mathematics) it shall range between 70 and 80.

The Proposed changes will facilitate students' employability as per the Industry requirements. It will provide them different verticals to learn and pursue their career. It will also make students more Research oriented and publish papers in Journals and Conferences.

Decision: Academic Council approved the revision of the program structure of the B.Sc. (H) & M.Sc. Programs in Physics, Chemistry & Mathematics with the stipulation that the Departments should once again check the prescribed credit required for award of degree and if needed, modify the same. Vice Chancellor was authorized to approve the same.

10.9.Consideration of the Program Structure of new Programs viz B.Ed. Special Education (Learning disability), PG Diploma in Educational Leadership & Management and Certificate Course in Early Childhood care and Education to be offered from Academic Session 2019-20.

The Council was apprised that syllabus for B.Ed. Special Education in Learning Disability is duly prescribed by Rehabilitation Council of India. The same syllabus for the programme shall be adopted. As far as other two programs viz. PG Diploma in Educational Leadership & Management and Certificate Course in Early Childhood Care and Education, Program structures for both the programs duly approved by the Board of Studies were considered for approval.

Decision: Academic Council considered and approved the same.

10.10 Approval of the scheme and syllabus for B.Tech. Electronics and Computer Engineering.

Academic Council was informed that the Department of Electronics and Communication Engineering has proposed revision in the program structure and syllabus of the above program as per the latest trend in the academia, need of the industry and suggestions given by the experts after due deliberation and approval of the BoS of the Department. Few subjects were shuffled from one semester to another, the contents of few were revised and few new subjects were introduced in the elective basket and necessary changes have been made in the revised scheme, syllabus and the overall credits. Total Credit of the Program is 164. Total Credit required for award of Degree of B. Tech, Electronic & Communication shall range between 160 and 170.

It was observed by one of the Hon'ble Member that Minimum Credits 164 prescribed is higher,hence, Dept should revisit the Credit of the Program and place before the Hon'ble Vice Chancellor for approval..

Decision: Academic Council approved the revision of the scheme and syllabus for B.Tech. Electronics and Computer Engineering with the stipulation that the Departments should reduce the total credit at par with the one prescribed by the AICTE for Engineering Programs. Vice Chancellor was authorized to approve the same.

10.11 Consideration of syllabus of two subjects for final year B. Tech. Electronics and Communication Engineering.

It was submitted for information of the Academic Council that in the revised course curriculum, the department has proposed changes in two subjects for courses of 7th semester, (batch 2017-2020) i.e. IoT and Microcontroller and Embedded System as there was overlapping in these two courses and few topics specified were giving limited information. Further, topics like magnetic sensors were incorporated instead of limiting to one sensor. The revised Program Structure and Syllabus was tabled for consideration of the Hon'ble Members.

Decision: Academic Council considered and approved the same

10.12 Approval of program structure of Mechanical Engineering with specialization in Smart Manufacturing & Automation.

It was submitted that the Dept. of Mechanical Engineering shall offer B.Tech Mechanical Engineering with specialization in Smart Manufacturing and Automation from the Academic Session 2019-20. The Board of Studies of the Department has approved the program structure in coherence with the model curriculum launched by the AICTE in recent past. Total credit assigned for the program was reported as 160. However, the total Credit required for award of degree shall range between 155 and 165. The Council. Considered the Program Structure and approved the same.

Decision: Academic Council approved the Program Structure of B.Tech. Mechanical Engineering with specialization in Smart Manufacturing & Automation. The approved program structure is annexed as Annexure No-I

10.13 Approval of panel of Experts for association with the Board of Studies, Board of faculties and selection committees etc.

The Council was informed that as per the provisions envisaged in the First Statutes, panel of experts has to be drawn by the Academic Council for constituting the Board of Studies, Faculty and the Selection Committees. Based on the reports from the HoDs that majority of Members being unapproachable and its being almost three year old panel of experts, it need to be drawn a fresh. The HoDs were requested to suggest the names of the eminent experts from the respective fields for preparing a new panel of expert, which was further reviewed and a final list containing the names of the experts was tabled before the Academic Council for approval.

Decision: Academic Council considered and approved the same. Vice Chancellor was authorized to nominate/approve the name of the experts in case experts named in the panel are not available for the meetings.

10.14 Approval of MRU (Students Promotion Policy) Regulation, 2019.

It was informed that Manav Rachna University follows Choice Based Credit System which allows students to study at their own pace by taking under-load or overload condition with the approval of concerned Dean & Head of the Department. In the learner centric system, the progression of a student is not bound by any condition other than

(i) Not being able to register for a course for which the pre requisite course is not clear.

(ii) Limit on credits registered in a semester.

It has been observed that there are cases of students who-

(1) are detained in a course/course(s) owing to not maintaining their attendance as per the cutoff limit decided for that course. In many cases, the number of such detained courses for a student are piling up since the students are either not registering for the course or are again failing to maintain the attendance.

(2) are unable to cope with the academic rigor of the program and accumulate large number of standing arrears which they are unable to clear even after repeated attempts.

Also, the Continuous Evaluation System followed by University has a rule under which a student failing a course is allowed to take supplementary examination in which he/she can score a maximum of 55% marks (75% in case of special medical/emergency cases) and all internal assessments are null and void. In many cases the students fail to clear their supplementary examinations even after

repeated attempts. The slow learners have bleak chances of maintaining a decent CGPA at the end of the programme and are acting as a demotivator for many students.

A draft Policy for Grade Improvement, Promotion and Course Registration under which a student may be permitted for promotion in higher studies in case of having backlogs and framework for students to complete the studies within timeline of course was considered by the Academic Council.

One of the Hon'ble Member mentioned that the minimum requirement of 75% Attendance should not be mandated for improvement of Grades and option be given to the students for improving his/her T1, T2 & Internal Assessment (Informal) Marks whereas, appearing in T3 Examination should be mandatory for improving the Grades. This was unanimously agreed by all the members and it was resolved that for improvement of grades the above provisions should be adopted and proposed policy may be amended to that extent.

Decisions: Academic Council approved the (Students Promotion Policy) Regulation, 2019 with the suggestion to modify the provisions regarding improvement of grades as opined by the members. Vice Chancellor was authorized to approve the amendments.

10.15 Amendment in Clause 1 (a) of MRU (First) Regulation, 2016 and (Third) Regulation, 2017 and Clause 1.1 of MRU (Second) Regulation, 2016.

It was submitted that following three Regulations were approved by the Board of Management on the recommendation of Academic Council-

1. Manav Rachna University (First) Regulation, 2016 on Unfair Means in Examinations

2. Manav Rachna University (Second) Regulation, 2016 relating to Sexual Harassment of women at work place.

3. Manav Rachna University (Third) Regulation, 2017, relating to prevention of Plagiarism in research work

With the nomenclature First, Second or Third, difficulty was noticed in identifying the subject matter of regulations to which it relates unless we look into the contents of the above regulations. With this background, it is proposed that Clause 1 (a) of MRU (First) Regulation, 2016 and (Third) Regulation, 2017 and Clause 1.1 of MRU (Second) Regulation, 2016 be amended as under:

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- Words "Manav Rachna University (First) Regulation, 2016" in Clause 1(a) under caption "Short Title, Application and Commencement" be substituted with "Manav Rachna University (Prevention of Unfair Means) Regulation, 2016".

- Words "Manav Rachna University (Third) Regulation, 2017" in Clause 1(a) under caption "Short Title, Application and Commencement" be substituted with "Manav Rachna University (Plagiarism Policy) Regulation, 2017".

- Words "MRU (Second) Regulation, 2016" in Clause 1.1 under caption "Short Title and Application" be substituted with "Manav Rachna University Sexual Harassment of women (Prevention, Prohibition and Redressal) Regulation, 2016"

Decision: Academic Council approved the above amendments in the Regulations.

10.16 Approval of Admissions made under Ph.D. program during 2018-19.

It was submitted for information of Council that 105 seats were earmarked for Ph.D program during the year 2015-16 which has been redistributed among the 03 faculty in the year 2017 as below:

1. Faculty of Engineering - 44
2. Faculty of Applied Sciences - 21
3. Faculty of Management and Humanities – 40

Further, with creation of two new faculties, they were allocated 10 seats each in the year 2017-18, as below-

1. Faculty of Education - 10
2. Faculty of Law – 10

Considering the large number of aspirants in Computer Science and Engineering, 04 seats from Faculty of Applied Sciences were utilized for admission to Faculty of Engineering. Out of 125 seats earmarked for Ph.D Programs in all the faculties 51 Seats were vacant for which admission were notified for 2018-19.

Faculty-wise / Discipline-wise admissions made under Ph.D Program during the year 2018-19 are as below:

Faculty of Engineering (CSE-10, ME-02 & ECE-02)	: 14
Faculty of Applied Sciences (Chemistry-01, Mathematics-01)	: 02
Faculty of Management and Humanities.	: 06
Faculty of Education	: 05
Faculty of Law	: 04

The list of Ph.D candidates admitted during 2018-19 was placed for consideration before the Hon'ble Members of the Council.

Decision: Academic Council approved the above admissions made under the Ph.D. program during the current Academic Session.

10.17 Approval of Program structure and Course Curriculum of BBA specializations in FAA, EFB and HCM for V and VI semesters.

Academic Council considered the Program Structure & Syllabus for 5th and 6th Semester for the three specialization of the program, submitted by the Dept. of Mgt and Commerce.

After deliberation, Department was advised to have a relook and submit the revised one to for approval.

Decision: Vice Chancellor was authorized to approve the programs structure and course curriculum of the three specializations of BBA Programs for 5th and 6th Semester.

10.18 Revision of program structure & syllabus for the revised courses of B.Sc.B.Ed from the Academic Year 2019-20.

Academic Council considered a proposal of the Department of Education & Humanities for minor revision in Program Structure of B.Sc.B.Ed program and syllabus for revised courses to maintain uniformity with the model curriculum provided by AICTE and after deliberation approved the same.

Decision: Academic Council approved the revision in program structure of B.Sc. B.Ed Program and syllabus for revised courses from the Year 2019-20. The copies of the revised program structure & syllabus for the new courses is annexed as Annexure No-II

SUPPLEMENTARY AGENDA

SA 10.1 Approval of Revised Program Structures for B.Tech. CSE and B.Tech. CSE with two specializations Machine Learning and Digital Transformation Engineering.

Academic Council considered the proposed revision in the Program Structure of the above three programs submitted by the Dept. of Computer Science and Technology. In the revised one, the Dept has proposed to reduce the contact hours and also reshuffled/swapped some of the courses from one semester to

other semesters. **Total Credits required for the above program and its specialization are given as below:**

B.Tech. CSE – 159, Specialization in DSML – 159 and Specialization in DTE - 158

However, Minimum Credits required for award of degree shall range between 155 to165.The students opting of specialization of the program shall be required to earned 20 credits more either in area concerned which will considered as major and will be eligible to receive honors degree or in allied area which will be considered as minor

Decision: Academic Council considered the proposed Changes and approved the same.

SA 10.2 Approval of format for Consolidated Transcript for all the UG and PG programs.

It was submitted for information that the Examination branch of the University has submitted a format of Consolidated Transcript to be given to students of B.Tech Programs, First batch (2015-19) of which shall pass out during the year 2019. The same format shall be used for preparing the Consolidated Transcript for other program viz. B.Sc. (H), BBA, Law (H), B.Ed., and Masters Program with changes as required in conformity with the duration of the Program. A sample format was placed before the Hon'ble Member for consideration.

Decision: Academic Council considered and approved the same.

10.19 Any other matter with the permission of Chair.

No item were presented,
The Meeting ended by vote of thanks to the Chair.

SD/-
Registrar

F.NO. MRU / AC (A&M) / Vol. III/2018/   **Dated 06.05.2019**

To,
1) PS to Chancellor for kind information to Hon'ble Chancellor
2) PS to VC for kind information to Hon'ble Vice Chancellor, MRU
3) PS to VP, MREI for kind information to Hon'ble Vice President
4) Prof. (Dr.) Meenakshi S. Khurana, Pro-Vice Chancellor & Dean, Academics, MRU
5) Prof. (Dr.) B.M. Bahal, Dean (Applied Sciences), MRU
6) Prof.(Dr.) S.K. Garg, Pro-V.C., Delhi Technological University, Delhi
7) Prof.(Dr.) R.K. Singh, Professor, Dept. of Com., Delhi School of Economics, N.D.
8) Prof.(Dr.) P.K. Bhatnagar, Prof. ECE Dept., University of Delhi, New Delhi.
9) Dr. Vandana Singh, Associate Professor, Dept. of Education, IGNOU, New Delhi

Minutes of the 10th Meeting of Academic Council held on 22.04.2019

10) Dr. S. K. Goyal ,Executive Director, Star Wire(India) Ltd. & former President, FIA, 21/4 Mathura Road, Ballabhgarh-121004 (Haryana).
11) Prof. (Dr.) Kanwal DP Singh, Dean, Faculty of Law, GGSIP Univ., New Delhi.
12) Dr. Sangeeta Banga, Professor, Chemistry, MRU
13) Prof. (Dr) Shruti Vashisht, Dean Student Welfare & HOD Dept. of ECE.
14) Prof. (Dr.) Parul Jhajharia, Dean, Faculty of Management and Commerce
15) Dr. Babita Prashar, Dean Education.
16) Ms. Hanu Bhardwaj, HoD, Dept. of Comp. Sci. & Technology.
17) Prof. (Dr.) Rajat Gera, HOD, Dept. Of Management, MRU
18) Dr. Sujata Nayak, HoD,Dept. of Mechanical Engg.
19) Dr. Haider Abbas, HOD, Dept. of Physics, MRU
20) Dr. Megha Mittal, HOD, Dept. of Chemistry, MRU
21) Prof. Jaideep Singh, HOD, Dept. of Humanities, MRU
22) Dr. Rashee Singh, HoD, Dept. of Education.
23) Dr. Parneeta Dhaliwal, HoD, Dept. of Mathematics
24) Dr. Varsha Vahini, HoD, Dept. of Law MRU
25) Prof. (Dr.) A. K Gupta, Professor, Dept. Of Chemistry, MRU
26) Prof. (Dr.) D.K. Sharma, Professor, Dept. of Physics, MRU
27) Ms. Meena Kapahi, Associate Professor, MRU
28) Dr. S.K. Shukla, Associate Professor, , MRU

MANAV RACHNA UNIVERSITY, FARIDABAD

DEPARTMENT OF MECHANICAL ENGINEERING

3 Weeks Induction Programme (Mandatory) (MEU01B)

SEMESTER - 1

NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	OVERLAPPING COURSES/ EQUIVALENT COURSES
BASIC SCIENCE COURSES	CHH144-T/P	CHEMISTRY	NIL	CHEM	HARD	CORE	3	1	2	0	6	5	
BASIC SCIENCE COURSES	MAH102B	MATHEMATICS-I	NIL	MATH	HARD	CORE	3	1	0	0	4	4	
ENGINEERING SCIENCE COURSES	MEH101B	ENGINEERING MECHANICS	NIL	ME	HARD	CORE	3	1	0	0	4	4	
ENGINEERING SCIENCE COURSE	ECH103B-T/P	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	NIL	ECE	HARD	CORE	3	1	2	0	6	5	
ENGINEERING SCIENCE COURSE	MEW106B	COMPUTER AIDED DRAFTING	NIL	ME	WORKSHOP	CORE	0	0	2	0	2	1	
PROFESSIONAL CORE COURSES	MEH105B	THERMODYNAMICS	NIL	ME	HARD	CORE	3	1	0	0	4	4	
MANDATORY COURSES	LWS324B	CONSTITUTION OF INDIA	NIL	LW	SOFT	AUDIT	2	0	0	0	2	0	
TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)							17	5	6	0	28	23	23

NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	
					SEMESTER - 2								
BASIC SCIENCE COURSES	MAH105B-T/P	MATHEMATICS-II (ORDINARY & PARTIAL DIFFERENTIAL EQUATION, NUMERICAL METHODS)	MATH-I	MATH	HARD	CORE	3	1	2	0	6	5	
BASIC SCIENCE COURSES	PHH110B-T/P	OPTICS & WAVE OSCILLATIONS	NIL	PHY	HARD	CORE	3	1	2	0	6	5	
ENGINEERING SCIENCE COURSES	CSH101B-T/P	PROGRAMING FOR PROBLEM SOLVING USING C	NIL	CS	HARD	CORE	3	1	2	0	6	5	
ENGINEERING SCIENCE COURSES	MEH103B-T/P	MANUFACTURING PROCESSES	NIL	ME	HARD	CORE	3	0	2	0	5	4	
AUDIT COURSE	CHH137	ENVIRONMENTAL SCIENCE	NIL	CH	NTCC	UNIVERSITY COMPULSORY	2	0	0	0	2	0	
HSMC	HLS104B/HLS103B-T/P	PROFESSIONAL ENGLISH-BASICS/PROFESSIONAL ENGLISH-ADVANCE	NIL	HUM	HARD	CORE	2	0	2	0	4	3	
		TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)					16	3	10	0	29	22	22
		Post 2nd Sem Summer Training (Mandatory) (Engineering Exploration- 2 CREDITS (60 Hrs)											2

NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	
						SEMESTER - 3							
PROFESSIONAL CORE COURSES	MEH207B	FLUID MECHANICS & MACHINES	NIL	ME	HARD	CORE	3	1	2	0	6	5	
BASIC SCEINCE COURSES	MAH203B	MATHEMATICS-III (PROBABILITY & STATISTICS)	NIL	MATH	HARD	CORE	3	1	0	0	4	4	
MOOC COURSES-I (*Student will opt one course through MOOC)												3	
PROFESSIONAL CORE COURSES	MEH204B	APPLIED THERMODYNAMICS	NIL	ME	HARD	CORE	3	1	2	0	6	5	
PROFESSIONAL CORE COURSES	MEH301B-T/P	MANUFACTURING TECHNOLOGY	NIL	ME	HARD	CORE	3	0	2	0	5	4	
UNIVERSITY COMPULSORY	FLS101/FLS102/FLS103	FOREIGN LANGUAGE-I	NIL	FL	AUDIT	ELECTIVE	2	0	0	0	2	0	
UNIVERSITY COMPULSORY COURSES	CDO201	PROFESSIONAL COMPETENCY ENHANCEMENT			Outcome Based		0	0	1	0	1	0.5	
UNIVERSITY COMPULSORY COURSES	RDO201	INTRODUCTION TO RESEARCH	NIL	ME	PROJECT BASE/INNOVATION		0	0	1	0	1	0.5	
TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)							14	3	8	0	24	22	22

NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	
						SEMESTER - 4							
PROFESSIONAL CORE COURSES	MEH205B-T/P	STRENGTH OF MATERIALS-I	NIL	ME	HARD	CORE	3	1	2	0	6	5	
PROFESSIONAL CORE COURSES	MEH305B-T/P	ROBOTICS	NIL	ME	HARD	CORE	3	1	2	0	6	5	
MOOC COURSES-I (*Student will opt one course through MOOC)												3	
PROFESSIONAL CORE COURSES	MEH206B	THEORY OF MACHINES	NIL	ME	HARD	CORE	3	1	2	0	6	5	
PROFESSIONAL CORE COURSES	MEH202B-T/P	MATERIALS SCIENCE	NIL	ME	HARD	CORE	3	0	2	0	5	4	
PROFESSIONAL CORE COURSES	CSH321B-T/P	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	NIL	CSE	HARD	CORE	2	0	2	0	4	3	
HSMC	LWS322B LWS321B	CYBER LAW/ LAW OF PATENTS	NIL	LW	HARD	CORE	2	0	0	0	2	2	
UNIVERSITY COMPULSORY	FLS105/FLS106/FLS107	FOREIGN LANGUAGE	NIL	FL	AUDIT	ELECTIVE	2	0	0	0	2	0	
UNIVERSITY COMPULSORY	CDO202	PROFESSIONAL COMPETENCY ENHANCEMENT			Outcome Based		0	0	0	1	1	0.5	
UNIVERSITY COMPULSORY	RD0202	INTRODUCTION TO RESEARCH	NIL	ME	PROJECT BASE/INNOV		0	0	1	0	1	0.5	
.		**TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)**					18	3	10	1	33	29	29
2		**Post 4th Sem Summer Training (Mandatory) - (60 Hrs)**											2

						SEMESTER - 5							
NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	
PROFESSIONAL CORE COURSES	MEH318B-T/P	COMPUTER AIDED DESIGN & MANUFACTURING	NIL	ME	HARD	CORE	3	0	2	0	5	4	
PROFESSIONAL CORE COURSES	MEH302B	MACHINE DESIGN-I	NIL	ME	HARD	CORE	3	1	0	0	4	4	
PROFESSIONAL CORE COURSES	CSH210B-T/P	DATA STRUCTURES	NIL	CS	HARD	CORE	2	0	2	0	4	3	
PROFESSIONAL CORE COURSES		INTERNET OF THINGS	NIL	ECE	HARD	CORE	2	0	2	0	4	3	
PROFESSIONAL CORE COURSES	MEH319B-T/P	MECHATRONICS	NIL	ME	HARD	CORE	3	0	2	0	5	4	
PROFESSIONAL CORE COURSES	MEH303B-T/P	HEAT TRANSFER	NIL	ME	HARD	CORE	3	1	2	0	6	5	
OPEN ELECTIVE COURSES	CHS234/CSS325/ ECS306	ENVIRONMENTAL ETHICS & SUSTAINABLE DEVELOPMENT/GREEN COMPUTING/E-WASTE MANAGEMENT	NIL	ME	SOFT	CORE	1	0	2	0	3	2	
UNIVERSITY COMPULSORY	MES325B	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	NIL	EDU	AUDIT	UNIVERSITY COMPULSORY	1	0	2		3	0	
UNIVERSITY COMPULSORY	CDO301	PROFESSIONAL COMPETENCY ENHANCEMENT		CDC	Outcome Based		0	0	1	0	1	0.5	
UNIVERSITY COMPULSORY	RDO301	INTRODUCTION TO RESEARCH	NIL	ME	PROJECT BASE/INNOV		0	0	1	0	1	0.5	
TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)							18	2	15	0	36	26	26

											NO. OF		
						COURSE TYPE (Core/Elective / University Compulsory)					CONTACT	NO.	
NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)		L	T	P	O	HOURS PER WEEK	OF CREDITS	
PROFESSIONAL CORE COURSES	MEH320B-T/P	INTERNAL COMBUSTION ENGINE & GAS TURBINES	NIL	ME	HARD	CORE	3	1	2	0	6	5	
HSMC	MEH310B-T/P	OPERATION RESEARCH	NIL	MGMT	HARD	CORE	3	1	0	0	4	4	
PROFESSIONAL CORE COURSES	MEH311B-T/P	REFRIGERATION & AIR CONDITIONING	NIL	ME	HARD	CORE	3	1	2	0	6	5	
PROFESSIONAL ELECTIVE COURSES	MEH307/MEH308B/MEH321B/-T/P	TOOL ENGINEERING DESIGN/PRODUCT DESIGN DEVELOPMENT//FUNDAMENTALS OF NANOSCIENCE & NANOTECHNOLOGY	NIL	ME	HARD	CORE	3	0	2	0	5	4	STUDENT WILL OPT FOR TWO SUBJECTS FROM THIS ELECTIVE BASKETS
PROFESSIONAL ELECTIVE COURSES	MEH312/MEH313B/MEH314B/-T/P	MECHANICAL VIBRATIONS/AUTOMOBILE ENGINEERING/COMPOSITE MATERIALS	NIL	ME	HARD	CORE	3	0	2	0	5	4	
OPEN ELECTIVE COURSES	ECH403B/CSH414B-T/P	WIRELESS SENSOR NETWORK/INFORMATION RETREIVAL	NIL	OPEN	HARD	ELECTIVE	3	0	2	0	5	4	
UNIVERSITY COMPULSORY	CDO302	PROFESSIONAL COMPETENCY ENHANCEMENT			Outcome Based		0	0	1	0	1	0.5	
UNIVERSITY COMPULSORY	RDO302	INTRODUCTION TO RESEARCH	NIL	ME	PROJECT BASE/INNOV		0	0	1	0	1	0.5	
		TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)					18	3	14	0	33	27	27
MEO317B		Post 6th Sem Summer Training (Mandatory) - (80 to 90 Hrs)											3

SEMESTER - 6

NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	
						SEMESTER - 7							
PROFESSIONAL ELECTIVE COURSES	MEH401/MEH402/MEH403/MEH306B-T/P	RENEWABLE ENERGY SOURCES/MACHINE DESIGN-II/POWER PLANT ENGINEERING/STRENGTH OF MATERIALS-II	NIL	ME	HARD	ELECTIVE	3	1	0	0	4	4	
HSMC	EDS288/ EDS289/ EDS290	HUMANITIES-I (APPLIED PHILOSOPHY/ APPLIED PSHYCHOLOGY/ APPLIED SOCIOLOGY)	NIL	EDU	SOFT	ELECTIVE	1	0	2	0	3	2	
PROFESSIONAL ELECTIVE COURSES	MEH405/MEH406/MEH409/MEH408B-T/P	COMPUTATIONAL FLUID DYNAMICS/OPTIMIZATION TECHNIQUES/HEATING VENTILATION & AIR CONDITIONING/ENERGY CONSERVATION & MANAGEMENT	NIL	ME	HARD	ELECTIVE	3	1	2	0	6	5	
OPEN ELECTIVE COURSES	ECW310/CSW318B	ELECTRONIC DESIGN WORKSHOP/AGILE TECHNOLOGIES	NIL	OPEN	HARD	ELECTIVE	0	0	2	0	2	1	
OPEN ELECTIVE COURSES	ECW310/CSW318B	SENSORS & IOT/R PROGRAMMING	NIL	OPEN	HARD	WORKSHOP	0	0	2	0	2	1	
HSMC	MCH321B	FINANCIAL & HUMAN RESOURCE MANAGEMENT	NIL	MGMT	SOFT	ELECTIVE	1	0	2	0	2	1	
HSMC	MCS368B	ENTREPRENERSHIP	NIL	MGMT	SOFT	CORE	2	0	0	0	2	2	
TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)							10	2	10	0	21	16	16

												SEMESTER - 8			

NOMENCLATURE AS PER AICTE	SUBJECT CODE	SUBJECT NAME	PRE-REQUISITE	**OFFERING DEPARTMENT	*COURSE NATURE (Hard/Soft/ Workshop/ NTCC)	COURSE TYPE (Core/Elective / University Compulsory)	L	T	P	O	NO. OF CONTACT HOURS PER WEEK	NO. OF CREDITS	
PROFESSIONAL CORE COURSES	MEN413B	PROJECT/INDUSTRIAL TRAINING	NIL	ME	NTCC	CORE	0	0	16	0	16	8	
		TOTAL (L-T-P-O/CONTACT HOURS/CREDITS)					0	0	16	0	16	8	8
													180

*MANDATORY FIELDS

Manav Rachna University
B.Sc. B.Ed. Program

New Courses

Calculus and Analytical Geometry –I (MAH117B)

Section A

Continuity and Differentiation – I: Limits, one-sided limits, Infinite limits and limits at infinity, Continuous functions, Discontinuous functions, Continuity theorems, Uniform continuity. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem. Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection.

Section B

Differentiation – II: Polar coordinates, angle between the radius vector and the tangent at a point on a curve, angle of intersection between two curves. Differentiability theorems, Rolle's theorem, Lagrange's Mean Value theorem, Cauchy's Mean Value Theorem, Taylor's theorem, Maclaurin's theorem, Generalised Mean Value theorem, Taylor's Infinite series and power series expansions, Maclaurin's infinite series, Indeterminate forms.

Section C

Analytical Geometry – I: General equation of second degree: Introduction, Condition for a pair of straight line, Condition for general equation of second degree to be a circle, parabola, hyperbola and ellipse.

Tracing of conics: Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic.

Section D

Analytical Geometry – II: Confocal conics: Introduction, equation of confocals to an Ellipse, properties of confocal conicsPolar equation of a conic: Polar equation of a straight line , polar equation of a circle, polar equation of conic, focal chord tangent and normal to the conic, pair of tangents. System of co-ordinates.

References:

1. Calculus by Anton, Addison-Wiley.

2. Calculus with Analytical Geometry by S K Stein, McGraw Hill.

3. Calculus and Analytical Geometry, Thomas and Finney, S.Chand and Co. Ltd.

4. Differential Calculus by Gorakh Prasad, Pothishala Ltd.

Calculus and Analytical Geometry -II(MAH119B)

Section A

Curves and Surfaces-I: Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-axial system of spheres.Cones. Right circular cone, enveloping cone and reciprocal cone.

Section B

Curves and Surfaces-II: Cylinder: Right circular cylinder and enveloping cylinder.Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a conicoid. Enveloping cylinder of a conicoid, Paraboloids.

Section C

Partial Derivatives: Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Partial Derivatives of higher order, Taylor's Theorem, Derivate of Implicit functions, Jacobians.

Section D

Integration: Reduction formulae: Derivations and illustrations of reduction formulae. Rectification: Length of arc of curves (cartesian, parametric and polar form). Quadrature: Area enclosed by curves (cartesian, parametric and polar form). Solids of Revolution: Volume and surface area of solids of revolution

Books:

1. Calculus by Anton, Addison-Wiley.

2. Calculus and Analytical Geometry, Thomas and Finney, S.Chand and Co. Ltd.

3. Integral Calculus by Shanti Narayan, S.Chand and Co.Ltd.

4. Elements of Analytical Solid Geometry by Shanti Narayan

Maths Lab (MAH120B)

LIST OF EXPERIMENTS:

1. Introduction to Mathematical Software and use of some simple Mathematical Software commands.

2. To define matrices and compute matrix operations.

3. Introduction to graphics: Basic Two-Dimensional Graphs, Labels, Multiple plots on the same axes, Line styles, Markers and color, Axis limits and Subplots.

4. To find limit & continuity of function of single variable.

5. To find differentiability of function of single variable.

6. Perform advanced operation on Matrices.

7. To find limit & continuity of function of several variables.

8. To find differentiability of function of several variables.

9. Compute differentiation of a function of single and several variables.

10. To find maxima and minima of function of several variables.

11. To find integral of a given function.

12. Multiple Integrals

Reference Books:

1. GNU Octave Beginner's Guide -by <u>Jesper Schmidt Hansen</u> (Author)

2. Introduction to GNU Octave -by <u>Jason Lachniet</u> (Author)

Probability & Statistics (MAH221-T)

SECTION A

Measures of Central Tendency: Introduction, types of averages- Mean, Median, Mode, Quartile, Percentile

Measures of Dispersion: Introduction, Significance of measuring variations, Range, Quartile deviation, Mean deviation, Standard deviation, Relation between them, Coefficient of variation

SECTION B

Skewness, Moments & Kurtosis: Introduction, Difference between dispersion and skewness, Measures of skewness, Karl Pearson's coefficient of skewness, Moments, Moments about arbitrary point, about mean, Measures of Kurtosis.

Correlation & Regression Analysis: Introduction, Types of correlation, Karl Pearson's coefficient of correlation, Introduction to regression analysis, Difference between correlation and regression analysis, Regression lines and Regression equations.

SECTION C

Probability Distributions: Random variable, probability distribution of a discrete & continuous random variable, cumulative probability function, moments, Mathematical expectation.

Theoretical Distributions: Binomial, Poisson and normal.

SECTION D

Test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Small samples: t – test, Test for single mean, difference of means and correlation coefficients, test for ratio of variances F Test, Chi-square test for goodness of fit and independence of attributes.

Recommended books:

1.   Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2.   Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3.   Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4.   S. P. Gupta, Statistical Methods, Sultan Chand & Sons, Educational publishers, New Delhi

Probability & Statistics Lab(MAH221-P)

List of Experiments

1.   Graphical representations of data: Pie Charts, Line Graphs, Bar Graphs, Histographs, frequency polygon.
2.   Calculating mean using excel
3.   Calculating median and mode using excel
4.   Calculate Quartile deviation, Mean Deviation
5.   Calculate Standard Deviation & coefficient of variation
6.   Rank & Karl Pearson's Coefficient of Correlation
7.   Plotting of Regression lines
8.   Compute probability of each element of the matrix row wise and column wise.
9.   Discrete & continuous probability distributions.
10. Testing of hypothesis

    Mini Projects:

a.   Collect data live – class test scores/ survey data and generate frequency distribution table and represent it graphically.

b.   Collect test scores of any school subject of any class and compute Mean, Quartile Deviation and Standard Deviation.

c.   Compute coefficient of correlation among language subject papers and core subject papers like – English and History, Mathematics and Science, etc.

d.   Study the sampling procedures adopted by taking various school contexts like selecting a team for school reports, team for debate competition

Complex Analysis & Numerical Analysis (MAH321B-T)

Section A

Numerical Methods: Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Newton-Raphson method. Finite differences, Forward and Backward differences, Interpolation, Newton-Gregory forward and backward interpolation formula, Divided differences, Lagrange's interpolation formula.

Section B

Numerical Differentiation: Finding first and second derivatives using interpolation formulae, Integration: General quadrature formula, Newton-Cotes quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Gauss quadrature.

Section C

Functions of a Complex Variable: Limits, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions. Conformal Mappings: Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations.

Section D

Complex Integration: Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula. Higher Derivatives. Power Series: Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions. (Remove) Add: - Taylor and Laurent Series, singularities and their types, Residue Theorem Application of residue theorem.

References:

1.   Theory of Functions of a Complex Variable by Shanti Narayan, S. Chand and Co. Ltd.
2.   Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.
3.   Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
4.   Functions of One Complex Variable by Conway, Narosa Publishing House.
5.   Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
6.   Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.
7.   Numerical Analysis by Gupta, S. Chand and Co. Ltd.
8.   Finite Difference and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
9.   Introductory Methods of Numerical Analysis by Shastry, PHI.
10. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
11. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
12. Numerical Calculus by William Edmund Milne, Princeton University Press.
13. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
14. Numerical Analysis by Schield, Schaum's Outline Series.
15. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.

Complex Analysis & Numerical Analysis Lab (MAH321B-P)

List of Programes
1.   Introduction to Conditional statements –if and else using Octave
2.   Introduction to iteration-based programming – for loop using Octave
3.   To find roots of an equation using Bisection method.
4.   To find roots of an equation using Regula Falsi method.
5.   To find roots of an equation using Newton Raphson method.
6.   To find the value of a dependent variable for a given value of an independent variable using Lagrange's interpolation method for a given set of data.
7.   To find the value of a dependent variable for a given value of an independent variable using
8.   Newton divided difference interpolation for a given set of data.
9.   To find the value of a definite integral using Trapezoidal rule of integration.
10. To find the value of a definite integral using Simpson's 1/3 rule of integration.

11. To find the value of a definite integral using Simpson's 3/8 rule of integration.

12. To find the solution of an ordinary differential equation of first order by Euler's modified method.

13. To find the solution of an ordinary differential equation of first order by R-K method.

Courses with Syllabus Revision

Real Analysis SYLLABUS PRIOR REVISION COURSE CODE: MAH248-T	SYLLABUS AFTER REVISION: COURSE CODE: MAH219B-T
Unit I: Real Numbers The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important subsets of Intervals, Countable and Uncountable sets. **Unit II: Neighborhoods and Limit Points** Introduction, Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness. **Unit III: Sequences** Introduction, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, Subsequences. **Unit IV: Infinite Series** Introduction, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Integral test, alternating series, Leibniz test, Conditional Convergence, Absolute convergence. References: 1. Real Analysis by J.M.Howie, Springer	Section A Real Numbers: The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important subsets of Intervals, Countable and Uncountable sets. Introduction, Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness. Section B Sequences: Introduction, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, Subsequences. Section C Infinite Series: Introduction, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Integral test, alternating series, Leibniz test, Conditional Convergence, Absolute convergence. Section D Riemann Integral: The Upper and lower R-integrals, Integrable (R) functions, Properties of definite and indefinite integral Riemann condition of integrability, Riemann sum, Basic inequality of Riemann integral, algebraic and order properties of the Riemann integral. Riemann integrability for continuous functions, monotonic functions and functions with finite

2007. 2. Real Analysis by Malik, Wiley Eastern. 3. Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd. 4.Mathematical Analysis by Malik and SavitaArora, New Age International Pvt. Ltd. 5.Real Analysis by Royden, Prentice Hall of India Pvt. Ltd 6.Mathematical Analysis by T M Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition. 7.Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984. 8.Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006. 9. Elementary Analysis – The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.	<mark>number of discontinuities</mark>. Recommended Books: 1. Real Analysis by Malik, Wiley Eastern. 2. Mathematical Analysis by Shanti Narayan, S. Chand and Co. Ltd. 3. Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd. 4. Principles of Mathematical Analysis by Walter Rudin, 2nd Edition, McGraw Hill Book Company, 1984.

Multivariate Calculus & Vector Calculus SYLLABUS PRIOR REVISION COURSE CODE: MAH350-T	SYLLABUS AFTER REVISION: COURSE CODE: MAH220B-T
Unit I: Line and Double Integrals Definition of a line integral and basic property, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Unit II: Triple Integrals Definition of a triple integral, Evaluation, Volume of a Triple integral. Unit III: Improper Integrals Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and	Section A Multiple Integrals: Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral. Section B Improper Integral: Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula. Section C Vector Differentiation: <mark>Limit & Continuity of</mark>

Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula. Unit IV: Vector Calculus Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane. References 1. Calculus by LipmanBers, Vols 1 and 2. 2. First Course in Calculus by Serge Lang 3. Calculus – Single and Multivariable by Hughes Hallet Calculus by Thomas and Finny.	vector functions, differentiation of vector functions, tangent and normal components of vector functions, vector fields and scalar fields, gradient of a scalar field and directional derivative. Divergence and Curl of a vector field and their physical interpretations, Irrotational and Solenoidal fields. Laplacian operator. Section D Vector Integration: Integration of vector functions Line integral, Integrals independent of path, Surfaces in space, Surface integral, Volume integral, Gauss Divergence theorem, Stoke's theorem and Green's theorem. References: 1. Calculus by Lipman Bers, Vols 1 and 2, Holt Rinehart and Winston publishers. 2. First Course in Calculus by Serge Lang, Springer. 3. Calculus – Single and Multivariable by Hughes Hallet, Wiley. 4. Calculus by Thomas and Finny, Pearson

Old Syllabus Education in Contemporary India (EDH214-T)	Revised Syllabus Education in Contemporary India (EDH214-P)
SECTION A INDIAN SOCIETY AND CONSTITUTION Stratification of Indian Society on the basis of Castes, Languages, Tribes, Religions and Regions. Preamble of Constitution, Directive principles, Article 45,21A, Fundamental rights and duties of Indian citizens, Equality of opportunities in education: Constitutional Provisions: Article 28,29,350,351, Education of socially disadvantaged segments namely Dalits, SC, ST, OBC, Women,	SECTION A INDIAN SOCIETY AND CONSTITUTION Social Stratification of Indian Society on the basis of Castes, Languages, Tribes, Religions and Regions. Preamble of Constitution, Directive principles, Fundamental rights and duties of Indian citizens, Article 45,21A, Equality of opportunities in education: Constitutional Provisions: Article 28,29,350,351, Education of socially disadvantaged segments namely Dalits, SC, ST, OBC, Women, PWD'S and minorities. EDUCATIONAL REFORMATION IN THE PRE-INDEPENDENCE PERIOD: Charter Act, Macaulay'minutes, Wood &Despatch, Hunter Commissions, Sargent Report, Basic education

PWD'S and minorities.

Impediments in achieving equity and justice in education- Inequality, discrimination and marginalization in Indian context, UEE- policy and problems

SECTION B
EDUCATION AND POLICY FRAMEWORK
EDUCATIONAL REFORMATION IN THE PRE-INDEPENDENCE PERIOD: Charter Act, Macaulay'minutes, Wood & Despatch, Hunter Commissions, Sargent Report, Basic education, Nayee Talim
EDUCATION IN POST INDEPENDENCE PERIOD: Mudaliar Commission (1952), Education Commission (1964-66), NPE 1968; NPE 1986 and its modified version 1992, Knowledge Commission, Yashpal Committee Report, Medium of Learning and three language formula, National Curriculum Framework-2005

SECTION C
EDUCATION SYSTEM AND STRUCTURES
Prominent characteristics of education in India during colonial rule, Concurrent status of education, Public Private Stratification in education, Types of schools in India - Govt. schools, Private schools
Role of educational agencies- NCERT, SCERT, CBSE, ICSE, Role of Directorates of Education, local bodies e.g.Panchayati Raj Institutions, Municipal Boards

SECTION D
EQUITY AND QUALITY ISSUES IN EDUCATION

SECTION B
EDUCATION AND POLICY FRAMEWORK
EDUCATION IN POST INDEPENDENCE PERIOD: Mudaliar Commission (1952), Education Commission (1964-66), NPE 1968; NPE 1986 and its modified version 1992, Yashpal Committee Report, National Curriculum Framework-2005,Right to Education Act 2009: Right of children to free and compulsory education,
NPE 2020, Midday meal scheme, Three language Formula

SECTION C
EDUCATION SYSTEM AND STRUCTURES
Concurrent status of education, Public Private Stratification in education, Types of schools in India, Role of educational agencies-NCERT, SCERT, CBSE, ICSE,
Open and Distance Education: Concepts, merits and demerits.

SECTION D
EQUITY AND QUALITY ISSUES IN EDUCATION
Equity in education, Modernization and Privatization of Education: Concept, merits and demerits, Role of teacher in universal and inclusive education
National System of Education, SarvaShikshaAbhiyan (SSA), Kasturba Gandhi BalikaVidyalaya, RashtriyaMadhyamikShikshaAbhiyan(RMSA)

<table>
<tr>
<td>Common School System, Right to Education Act 2009: Right of children to free and compulsory education, Modernization and Privatisation of Education: Concept, merits and demerits, Role of teacher in universal and inclusive education National System of Education, Mid Day Meal Programme, Sarva Shiksha Abhiyan (SSA), Kasturba Gandhi Balika Vidyalaya, Rashtriya Madhyamik Shiksha Abhiyan(RMSA), Women education- concept, need, problems and reforms.</td>
<td></td>
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<td>Old Syllabus
Education in contemporary India (EDH 214-P)</td>
<td>Revised Syllabus
Education in contemporary India (EDH 214-P)</td>
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<tr>
<td>1. Collaboration with any NGO working for Marginalized groups, Conducting field visits, case studies, and participating in their projects.
2. Review of Mid-day meal programme in a particular rural area.
3. Review of recent articles, editorials, research papers etc. on emerging issues e.g. implementation of RTE/ Equal opportunities for all/ various govt. schemes for universalization of education, girl education/and modernization of education etc.
4. Group discussion on fundamental rights, duties and directive principles.
5. Debate on true women empowerment.</td>
<td>1. Discussion on Types of School through collaborative approach
2. Preparation of Charter for School- Individual Project
3. Extempore on current trends on Education
4. Project work on NEP 2020 focusing on the major recommendations
5. Documentary Analysis of Kasturba Gandhi Balika Vidyalya Scheme
6. Critical Analysis of the Initiatives for the upliftment of marginalised sections of society.
7. Group discussion on fundamental rights, duties and directive principles.</td>
</tr>
</table>

Old Syllabus E learning (EDW228)	Revised Syllabus E-Learning (EDW228)
Unit 1: Basic of e-learning • Concept of e-learning • Types of e-learning • Terminologies related to e-learning Activity • Learners create mind map of e-learning Unit 2: Use of ICT for learning management • Record keeping and scheduling tools • Communicative tools • Learning management system- Introduction Activity • Use Google classroom, create classroom, create assignment • Use google drive and dropbox for storing document Unit 3:ICT for teaching learning process • Blended learning approach for e-learning • Tools for conducting online classes • Digital tools for collaborative & constructive learning-Google doc, Discussion forum, Activity: • Prepare a week plan of teaching using blended learning approach • Analyse online platforms for online classes • Conduct a seminar using online platform • Discuss any ICT related issue using any mode of online discussion forum.	Week 1: • Concept of e-learning • Types of e-learning Activity • Learners create mind map of e-learning Week 2 & 3 Use of ICT in administration • Record keeping and scheduling tools • Communicative tools • School management tools/software Activity • Create and communicate google group through google classrom • Use google drive and dropbox for storing document • Analyse school management software and have discussion on it through discussion forum Week 4 to week 6 ICT for teaching learning process • Blended learning approach for e-learning • Digital tools for effective learning-Webquest, webinars discussion forum, blog Activity: • Prepare a week plan of teaching using blended learning approach • Create a webquest • Make a seminar using webinar • Create a blog for learning • Select a case study/report related to legal and ethical issues in use of ICT. Discuss your case using any mode of online discussion forum. Submit the screenshots of your group discussion. Week 7 & 8 OER • Open educational resources Activity • Identify suitable Open educational resources • Select any topic and collect Open Educational Resources (Text, Multimedia, Website references) and analyze the type of license used in the Open Educational Resources. Submit the report for the same with evidences. Week 9 & 10

Unit 4: ICT in Assessment
  • ==Computer assisted assessment==
  • Use of e-portfolios, Rubrics in assessment
  • Use of innovative strategies for formative assessment
Activity
  • Create e portfolio of this workshop
  • Create rubric to assess group discussion
  • Generate a test
  • Create crosswords puzzles etc
	ICT in Assessment:
	  • ==Computer assisted assessment==
	  • Computer adaptive testing
	  • Use of e-portfolios, Rubrics and webquest in assessment
	Activity
	  • Create e portfolio of this workshop
	  • Create rubric to assess group discussion
	  • Generate a test
	  • Submit a reflective report on it.

Multivariate Calculus & Vector Calculus SYLLABUS PRIOR REVISION COURSE CODE: MAH350-T	SYLLABUS AFTER REVISION: COURSE CODE: MAH220B-T
Unit I: Line and Double Integrals Definition of a line integral and basic property, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Unit II: Triple Integrals Definition of a triple integral, Evaluation, Volume of a Triple integral. Unit III: Improper Integrals Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions,	Section A Multiple Integrals: Definition of a line integral and basic properties, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas. Definition of a triple integral, Evaluation, Volume as a Triple integral. Section B Improper Integral: Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula. Section C Vector Differentiation: ==Limit & Continuity of vector functions, differentiation of vector functions, tangent and normal components of vector functions, vector fields and scalar fields, gradient of a scalar field and directional derivative. Divergence and Curl of a vector==

Application to Evaluation of Integrals, Duplication formula, Sterling formula.

Unit IV: Vector Calculus

Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane.

References

1. Calculus by LipmanBers, Vols 1 and 2.
2. First Course in Calculus by Serge Lang
3. Calculus – Single and Multivariable by Hughes Hallet
Calculus by Thomas and Finny.

field and their physical interpretations, Irrotational and Solenoidal fields. Laplacian operator.
Section D
Vector Integration: Integration of vector functions Line integral, Integrals independent of path, Surfaces in space, Surface integral, Volume integral, Gauss Divergence theorem, Stoke's theorem and Green's theorem.

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1. Calculus by Lipman Bers, Vols 1 and 2, Holt Rinehart and Winston publishers.
2. First Course in Calculus by Serge Lang, Springer.
3. Calculus – Single and Multivariable by Hughes Hallet, Wiley.
4. Calculus by Thomas and Finny, Pearson