



**Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)**

Newai, P.O.Newai, Bhilai, Distt.Durg (Chhattisgarh) 491107

Ph.No.:0788 - 2200062, Website: www.csvtu.ac.in, E-mail: registrar@csvtu.ac.in

**ADMISSION IN Ph.D. PROGRAMME 2023**

Adv.No.:CSVТУ/Ph.D/2023/132 Bhilai-Newai Date:01/08/2023

Applications are invited in prescribed form for admission in Ph.D Programme in various disciplines through Notification No.: CSVТУ/Ph.D/2023/4131, Bhilai - Newai Date: /08/2023 for admission in Ph.D. programme. For details, visit University website. www.csvtu.ac.in The last date for submission of application at the University through online is "30/08/2023".

**REGISTRAR  
CSVТУ, BHILAI (C.G.)**

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क्रमांक /छगस्वावितविवि/पीएच.डी./2023 413/ भिलाई-नेवई, दिनांक: 31/ 08 /2023

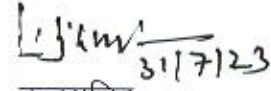
### अधिसूचना

1. पीएच. डी. प्रवेश परीक्षा 2023, 15 सितम्बर 2023 को आयोजित की जाएगी। पीएच. डी. में प्रवेश हेतु आनलाइन (online) आवेदन पत्र जमा करने की अंतिम तिथि 30/08/2023 रात्रि 12 बजे तक निर्धारित की जाती है।
2. पीएच. डी. प्रवेश परीक्षा आवेदन पत्र विश्वविद्यालय की वेबसाइट की आनलाइन लिंक से जमा होगा।
3. शोध केन्द्रों की सूची, रिक्तियों की जानकारी एवं पाठ्यक्रम (Syllabus) परीक्षा पद्धति एवं अन्य संबंधित जानकारी [www.csvtu.ac.in/ew/research/phd-information](http://www.csvtu.ac.in/ew/research/phd-information) पर उपलब्ध है। शोध केन्द्रों की विस्तृत जानकारी उनकी वेबसाइट से प्राप्त की जा सकती है।
4. पीएच. डी. प्रवेश परीक्षा के आवेदन पत्रों का परीक्षण विश्वविद्यालय द्वारा करने के पश्चात् लिखित परीक्षा एवं लिखित परीक्षा से छूट प्राप्त आवेदकों की प्राविधिक सूची (Provisional List) प्रकाशित की जायेगी। प्राविधिक सूची के पश्चात् आवेदकों को तीन दिनों में दावा-आपत्ति करने का अधिकार होगा। तत्पश्चात् लिखित परीक्षा एवं छूट प्राप्त पात्र आवेदको की सूची प्रकाशित की जावेगी।
5. संशोधित अध्यादेश क्र. 10 की कण्डिका क्र. 4.5 के प्रावधान के अनुसार प्रवेश परीक्षा से छूट की पात्रता रखने वाले आवेदकों को भी निर्धारित अवधि में ही प्रवेश आवेदन पत्र आनलाइन माध्यम से जमा करना होगा। आवेदन पत्रों की जाँच संबंधित DRC द्वारा लिखित परीक्षा के बाद करके सभी आवेदकों की सूची (लिखित परीक्षा उत्तीर्ण तथा लिखित परीक्षा से छूट प्राप्त) विश्वविद्यालय को उपलब्ध करायी जावेगी साथ ही आवेदकों को भी सूचित किया जाएगा।
6. आवेदन पत्र स्वीकार करते समय यह सुनिश्चित किया जावेगा कि आवेदक ने समस्त जानकारियों का उल्लेख अपने आवेदन पत्र में किया है तथा समस्त आवश्यक दस्तावेज संलग्न किया है या नहीं।
7. पीएच. डी. प्रवेश परीक्षा का परीक्षा केन्द्र व समय निर्धारित तिथि से 07 दिनों पूर्व घोषित कर दिया जावेगा साथ ही प्रवेश पत्र संबंधित आवेदकों को विश्वविद्यालय की ओर से ईमेल द्वारा उपलब्ध करा दिया जावेगा।
8. विभागीय शोध समिति (DRC) द्वारा शोध निर्देशकों के अधीन शोधार्थियों के प्रवेश हेतु छत्तीसगढ़ शासन के आरक्षण नियमों का पालन सुनिश्चित किया जावेगा।
9. शोध निर्देशकों के अधीन रिक्तियों की संख्या परिवर्तनीय है।



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9. आवेदन पत्र के साथ नियोक्ता का अनापत्ति प्रमाण पत्र एवं सेवा प्रमाण पत्र संलग्न किया जाना आवश्यक है।
10. आवेदक अपने शोध केन्द्र का चयन शोध केन्द्रों की सूची के अनुसार करेंगे।
11. शोध केन्द्र पीएच.डी. में प्रवेश हेतु प्राप्त आवेदनों की जांच लिखित परीक्षा में सफल होने के बाद अध्यादेश क्र. 10 के प्रावधानों के अनुसार करेंगे।
12. आवेदक पीएच.डी. प्रवेश हेतु आनलाइन फार्म भरने के समय किसी भी तकनीकी समस्या के लिए हेल्पलाइन नं 07882445035 पर प्रातः 10.30 से 05.30 बजे के मध्य बात तथा csvtu.digiversity@gmail.com में ईमेल कर सकते हैं।

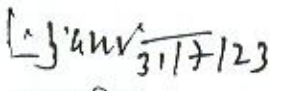
  
31/7/23  
कुलसचिव  
छगस्वावितवि भिलाई

पृष्ठ.क्रमांक 4132/छस्वावितवि/पीएच. डी./2023

भिलाई-नेवई, दिनांक: 31 / 7 / 2023

प्रतिलिपि:-

1. समस्त शोध केन्द्र एवं समस्त संबद्ध संस्थाएँ, विवि शिक्षण विभाग (UTD) छगस्वावितवि, भिलाई की ओर सूचनार्थ एवं कार्यवाही हेतु।
2. विशेष कर्तव्यस्थ अधिकारी (अका/परीक्षा) को सूचनार्थ एवं आवश्यक कार्यवाही हेतु।
3. विशेष कक्ष (सूचना प्रकोष्ठ) को सूचनार्थ तथा विश्वविद्यालय की वेबसाइट पर अपलोड हेतु।
4. निज सचिव माननीय कुलपति।
5. मास्टर फाइल।
6. संपादक, समस्त दैनिक समाचार पत्र, भिलाई को सूचनार्थ कि इस समाचार को अपने दैनिक में छात्रहित में समाचार के रूप में प्रकाशित करने का कष्ट करें।

  
31/7/23  
कुलसचिव  
छगस्वावितवि भिलाई



# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI छत्तीसगढ़ स्वामी विवेकानंद तकनीकी विश्वविद्यालय, भिलाई

## Instructions for Ph.D Entrance Test 2023

### 1. Written Test

There would be one written paper in two sections of 100 marks for 3 hrs.

Section – I 40 objective type questions from respective discipline. (40 Marks)

Section – II 60 objective type questions from specialized area of respective discipline.  
(60 Marks)

Note - **(For Humanities will be one section of 100 marks)**

### 2. Personal Interview (for both type of candidates)

### 3. Exemption from written test

- i. Candidates with valid score card of UGC/CSIR NET (including JRF) examination, SLET, GATE or GPAT.
- ii. Candidates possessing M.Phil. degree through a regular programme from a University, a deemed university or any other university incorporated by any law for the time being in force and recognized by the university.
- iii. Teacher fellowship holder and University/College teachers holding a regular position (regular appointment) and has completed two years of service as teacher in a department of the University/affiliated college/Institution.
- iv. Scientist of State/National/International Govt. Institutions/R&D Laboratories having at least three (3) years of research experience and relevant publications.
- v. Candidates having Fifteen (15) years of Industrial/field experience.



**Modified Ordinance after  
Amendment**

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY  
BHILAI**

**Ordinance No. 10  
(Under Section 38)**

**Modified Ordinance for Doctor of Philosophy (wef ...08/12/2020..)**

**Preamble**

Modified Ordinance for Award of Ph.D. Degree (Full Time & Part Time basis), Chhattisgarh Swami Vivekanand Technical University 2019 are framed in suppression of Chhattisgarh Swami Vivekanand Technical University, Bhilai, Ordinance No. 10 (Under Section 38) implemented in accordance with the UGC(Minimum Standards and Procedure for Award of M.Phil./Ph.D. Degree) Regulations 2016 notified in The Gazette of India- Extra Ordinary {no. 28,Part III-Section 4, for the week July11- July17, 2009] on May 5th 2016 vide File/Letter No.F.1-2/2009(EC/PS) V(I) Vol. II – in exercise of the powers conferred by clauses (f) and (g) of subsection (1) of Section 26 of University Grants Commission Act 1956 (3 of 1956).

1. The degree of Doctor of Philosophy (Ph.D.) may be granted in any discipline belonging to any Faculty of Chhattisgarh Swami Vivekanand Technical University (hereinafter: University), in which Post-Graduate studies and/or research is available at the University or at its affiliated Colleges/Institutions that are recognized as Research Centers by the University.
2. **Constitution of Departmental Research Committee (DRC)**  
All academic matters related to Ph.D. degree shall be processed by a Departmental Research Committee (hereinafter: DRC) consisting of the following:

1	<i>Head of the School/Department, for UTD or Principal/Director for affiliated Colleges/ Institutions of the University</i>	<i>Chairman</i>
2	<i>Head of the concerned department for affiliated college/institution provided that the Head of the department holds a Doctorate degree in the relevant discipline</i>	<i>Member</i>
3	<i>Two faculty members from the UTD/Research Center/any other Institute who are recognized Ph.D. Supervisors</i>	<i>Members</i>
4	<i>One member nominated by the Kulpati/Vice Chancellor</i>	<i>Member</i>

Three (03) members including the Chairman will form the quorum.

**3.0 Eligibility for registration for degree of Doctor of Philosophy**

The following candidates are eligible to seek admission in the Ph.D. program:

- 3.1 Master's degree / M.Phil. holders with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) and successfully completing the Master's degree shall be eligible for Ph.D.
- 3.2 **Minimum qualification for admission to the first year Ph.D. in Engineering Stream shall be M.E./M.Tech. in appropriate branch with at least 60% marks aggregate or its equivalent CGPA from any recognized university/institutions/technical university/Deemed University or any other qualification as recommended by UGC/AICTE for a particular course. Student may opt for any stream for Ph.D. related to his/her BE./B.TECH. or M.E./M.Tech. degree.**
- 3.3 Candidates possessing a degree considered equivalent to Master's / M.Phil. of an Indian Institution, from a Foreign Educational Institution recognized or authorized by an authority, established or incorporated under a law in its home country or any other standard statutory authority in their country, shall be eligible for admission to Ph.D. program.
- 3.4 A relaxation of 5% marks for 55% to 50% or an equivalent relaxation of grade maybe allowed for those belonging to SC/ST/OBC (non-creamy layer) /differently-abled and other categories of candidates as per the decision of the commission from time to time.

**4.0 Procedure for Registration**

- 4.1 The selection for admission to Ph.D. degree programme will be done through an Entrance Test conducted by the University followed by personal interview of the candidate. The Entrance Test will be conducted at the University level once in a year (however looking into the number of applications the frequency of holding the Entrance Test may be increased to Twice in a year).
- 4.2 The number of Ph.D. scholars, to be admitted to each subject of study at the University Teaching Departments and duly approved research centers, shall be decided based on number of available research Supervisors and other academic as well as physical facilities available, in accordance with the norms regarding the scholar-teacher ratio, laboratory, library and such other facilities.
- 4.3 The University shall notify every year, well in advance, in the website and through advertisement (in at least two national news papers, of which at least one shall be in the

regional language), the number of seats for admission, subject/discipline-wise distribution of available seats, criteria for admission, procedure for admission, examination centre(s) and date(s) of entrance test(s) and all relevant information for the benefit of candidates.

- 4.4 Admission shall be based on the criteria notified by the University, keeping in view the guidelines/norms in this regard issued by UGC and other statutory bodies concerned, and taking into account the reservation policy of the State Government/University applicable to SC/ST/OBC (non-creamy layer)/differently-abled and other categories as decided by the State Government/University from time to time.

Candidates eligible for registration to Ph.D. shall be decided by two stage process – Entrance Test and Interview/Viva-voce.

- 4.5 The requirements of entrance test is relaxed for
- i. Candidates with valid score card of UGC/CSIR NET (including JRF) examination, SLET, GATE or GPAT.
  - ii. Candidates possessing M.Phil. degree through a regular programme from a University, a deemed university or any other university incorporated by any law for the time being in force and recognized by the university.
  - iii. Teacher fellowship holder and University/College teachers holding a regular position (regular appointment) and has completed two years of service as teacher in a department of the University/affiliated college/Institution.
  - iv. Scientist of State/National/International Govt. Institutions/R&D Laboratories having at least three (3) years of research experience and relevant publications.
  - v. **Candidates having Fifteen (15) years of industrial/field experience.**

- 4.6 The DRC shall scrutinize the candidate's eligibility for appearing at the entrance test. The validity of the Entrance Test will be for two years and relaxation from entrance test as well.

- 4.7 The qualifying marks for the Entrance Test and Personal Interview will be 50% individually. Candidates exempted from test will be assessed through Personal Interview based on presentation and interaction on area of interest before DRC.

- 4.8 It shall be assessed at the interview/Viva-Voce whether
- (a) the candidate possesses the competence for the proposed research;
  - (b) the research work can be suitably undertaken at the research center;
  - (c) the proposed research can contribute to new/additional knowledge.

- 4.9 The syllabus of the Entrance Test shall consist of questions based on research methodology (50 %) and the subject of study concerned (50%). The qualifying marks for Entrance Test will be 50%.

**4.10** The modalities of the Entrance Test will be decided by the University.

**Note:** *No TA/DA shall be payable to the candidates appearing at the Personal Interview. In case of postponement of the Personal Interview due to unavoidable reasons, no compensation will be provided to the candidates.*

#### **5.0 Procedure for Admission**

**5.1** An eligible candidate must apply for registration for Ph.D. programme of his/her subject on the prescribed form obtainable on payment of prescribed fee. The application shall be evaluated by the DRC of the concerned UTD/School of the University/Affiliated College/Institution.

**5.2** The DRC will allocate the Supervisor/Co-supervisor with mutual consent of the candidate and Supervisor/Co-supervisor, for an eligible candidates depending on the number of students per Supervisor/Co-Supervisor, the available specialization among the faculty supervisors and the research interest of the student as indicated during personal interview of the student.

**5.3** Scholars already admitted to Ph. D Course in any recognized university/ institute may be transferred/ admitted, after checking the due equivalency of the status of Ph. D. work on the recommendation of the committee constituted by the Kulpati of the university.

#### **6.0 Credit requirements & Course Work**

After having been admitted, each Ph.D. student shall be required to undertake course work. The duration of the course shall be two semesters each of six-month duration for all Candidates. The course work must include Research Methodology which may consist of quantitative methods and computer applications.

**6.1** Each course will be of 4 credits and all students shall complete credit requirements through course work as specified in the Table below:

Se. No.	Qualification possessed by Candidate	Required Credits
1	M.Tech. or Equivalent; or MBA with B. Tech. (for management only)	12
2	<b>M.Sc/MCA/MA/M. Pharma/MBA or equivalent</b>	16
3	<b>M.Sc/MCA/MA/M. Pharma/MBA with M.Phil.</b>	12

**6.2** The course content shall be designed by the Board of Studies (BoS) of the concerned subject/stream. The course work may also involve reviewing of published research works in the relevant field.

All courses prescribed for Ph.D. course work shall be in conformity with the credit hour instructional requirements and shall specify content, instructional and assessment methods duly approved by the concerned Board of Studies (BoS) of the University.

- 6.3 The scheme of teaching and examination for the course work will be decided by the University. The contents of the course work specific to the area of research of the candidate are to be proposed by the Supervisor in consultation with the Co-supervisor/s (if any) and approved by Board of Studies (BoS) on recommendation of DRC.
- 6.4 In addition, a candidate shall be required to audit a course on "Communication Skills". However, a student, on recommendations of his/her Supervisor, can be exempted by the DRC from the requirement of auditing the Communication Skills course if it is convinced that the student already has adequate knowledge/exposure of Communication Skills.
- 6.5 The course work shall be treated as pre Ph.D. preparation and it shall include:  
(i) Semester one shall comprise of a course on Research Methodology as a compulsory subject which shall include quantitative methods, and Computer Applications, Research ethics and review of published research in the relevant field, training, and the field work along with other areas found relevant to the discipline concerned and one of the elective suggested by Supervisor/Co-supervisor.  
(ii) In second semester, the candidate has to choose either one or two electives depending on number of credits required with the consent of his/her Supervisor/Co-supervisor. The courses shall be advanced level areas in the subject concerned for enabling the students to acquire deep knowledge for the preparation of Ph.D. degree.

It is expected that full time and part time students will complete their course credit requirements in initial two semesters.

Minor Project and Seminar can also be taken as Subject of credits.

- 6.6 On the recommendation of the Supervisor, the course work related to research area should be carried out by the candidate at the approved Research Center/University. The candidate shall be evaluated at the end of the semester by DRC and one external examiner nominated by Vice-Chancellor. If the candidate is not able to pass the course with minimum 55% marks in aggregate along with at least 40% marks in theory paper of the concerned subject and at least 70% marks in the internal continuous assessment, the candidate has to qualify the related course work in immediate next examinations.
- 6.7 Scholars admitted to the Ph.D. program shall be required to complete the course work prescribed by the Department within two years of his/her admission failing which his/her candidature shall be cancelled.

- 6.8 Scholars already holding M.Phil. degree through regular mode in the relevant subject and admitted to the Ph.D. program and completed the research methodology course work as per norms, may be exempted from course work on recommendations of DRC.

#### 6.9 Part Time Registration

Candidates, who are working in reputed research organizations, academic Institutes and industries, situated preferably in the close vicinity of CSVТУ, are eligible to apply for admission in "Part-Time" Ph. D. program.

Teachers of affiliated colleges/University Departments/Higher Secondary Schools, candidates appointed as Research Fellows or Research Assistants in Research projects run in the University Departments/Affiliated Colleges /Research Institutes and Scientists working in the Research Institutes, Technical Experts working in Laboratories, members of any professional institutes approved by Government of India, Permanent employees of CSVТУ satisfying the eligibility criteria for admission as stated in ordinance are eligible to apply for part time research and such candidates are to undergo one year regular full time compulsory course work, provided that the applicant should fulfill all the mentioned conditions in the ordinance.

#### Eligibility Criteria

- The candidate should be working in an organization which encourages and facilitates research.
- He/She meets the requisite minimum qualification for admission to Ph. D. program of CSVТУ.
- The candidate should have a minimum of two years work experience in related field.
- The candidate should furnish a "consent & No objection certificate" from his/her parent organization in the attached format.

The part time research student shall attend the Research Centre for at least 60 working days in a year (minimum 3 attendances in a month).

- 6.10 All existing academic regulations will be applicable to part-time Ph. D. students, unless specifically mentioned otherwise.

#### 7.0 Fees

Registration fee for Ph.D. program is to be paid to the University at the prevalent rates as announced by the University from time to time.

- (a) The fees payable in every six months at the research centre are as follows:  
(i) Tuition fee (ii) Library fee (iii) Laboratory fee (where laboratory work is involved).
- (b) The fees payable only once at the research centre are as follows:

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- (i) Library caution money (refundable)                      (ii) Laboratory caution money (refundable)  
(iii) Identity card fee    (iv) Development fee.
- (c) The University Library fee shall be as follows:  
(i) University Library fee (payable every six months)  
(ii) University Library caution money payable once only and refundable.
- (d) The fees mentioned in para (a), (b) and (c) above will be as prescribed by the University from time to time.
- (e) The six monthly fees shall be paid till the student submits his/her Ph.D. thesis.
- (f) The teachers of the University/Affiliated colleges and teachers under the UGC/AICTE teacher fellowship scheme or any other scheme will also be required to pay the fees as per rules.

### **8.0 Research Degree Committee (RDC)**

- 8.1** After successful completion of the Pre-Ph.D. course work, the candidate shall be eligible to submit a synopsis (as per the prescribed format) of his/her proposed research work along with the title of the thesis (in six copies) duly forwarded by the Supervisor/Co-supervisor & the Chairman of the relevant DRC.
- 8.2** The candidate shall be required to make an oral presentation of the proposed work before the Research Degree Committee (RDC) consisting of the following members:
- i. Kulpati/Vice Chancellor or his nominee.
  - ii. Dean of the faculty.
  - iii. Head of the University Teaching Department/School of Studies/Institution in the subject.
  - iv. Chairman, Board of Studies in the subject.
  - v. One external subject expert of the rank of University Professor to be nominated by the Kulpati/Vice Chancellor, ordinarily out of a panel of 5 experts given by the Chairman of the Board of Studies (BoS) concerned. The term of panel shall be co-terminus with the term of Chairman Board of Studies.

*External Expert and two other members will form the quorum.*

#### **Note:**

- i) The Supervisor/Co-supervisor is entitled to be present during the oral presentation of the candidate.
  - ii) No TA and DA shall be payable to the candidate and the Supervisor/Co-supervisor (if any) for attending the RDC meeting.
- 8.3** The meeting of the RDC shall be held in the University office twice in Academic Year, preferably in July and January. The committee shall consider the application of the persons who want to get recognized as Supervisor/Co-supervisor and recommend their eligibility if found as per provisions of this Ordinance.

The committee shall also provide the list of all the approved Supervisors/Co-supervisors, along with their specialization, proposed by different DRC's from time to time. This list shall be available with the Registrar/Academic Section of the University and on the website of the University.

- 8.4 The committee shall formally recommend for the registration of the candidate for the Ph.D. programme after approving title of the thesis, Synopsis, Supervisor, Co-supervisor/s (if any) and the place of research work. The RDC has the right to suggest revision/alterations (if required) in the synopsis forwarded by the DRC.

On approval by the RDC the candidate shall be registered and enrolled as a student from the date of his/her RDC meeting if the candidate pays his/her Registration, library and laboratory fees within 15 days from date of meeting. The letter of registration shall be issued by the Registrar, and sent to all those concerned. The candidate has to pay the regular tuition, library and laboratory fees every six-month during his/her research tenure.

- 8.5 The University shall maintain the list of all the Ph. D. registered students, including name of the registered candidate, topic of his/her research, name of Supervisor/Co-supervisor/s, date of enrolment/registration on its website on year-wise basis.
- 8.6 If the RDC decides that minor/major revision is required in the synopsis and or the oral presentation was also found to be unsatisfactory, then the candidate may be asked to revise the synopsis and or improve upon the oral presentation and reappear at the next meeting of the RDC. If only changes in Synopsis are suggested, the synopsis should be resubmitted after incorporating the changes within 1 month.
- 8.7 **If the RDC does not recommend a candidate for registration to Ph.D. programme, the candidate shall be communicated the same by the Registrar. In such case, only the caution money deposited by the candidate shall be refunded. However if the rejected candidate or candidate who failed to appear in RDC process is willing to reappear for RDC then Hon'ble Vice Chancellor may take decision for such special cases and candidate will have to apply through an application with prescribed fees in the university.**

- 8.8 The medium of instruction and examination shall be English throughout the course of study.

#### 9.0 Subject of Research

A candidate shall ordinarily be permitted to work for Ph.D. degree in the subject in which he/she has obtained his/her Post-graduate degree or the Bachelor degree (as per clause 3).

Provided that research work leading to Ph.D. degree may be encouraged in allied subjects of interdisciplinary nature of the same faculty or of allied faculty. In such cases the candidate may also be permitted to work under one or two Co-supervisors, along with the Supervisor of the University.

#### **10.0 Place of Research**

A candidate shall pursue his/her research at the institution from where his/her application form has been forwarded by DRC.

Provided that a candidate permitted to work in a research establishment recognized by the University shall be required to take at least one Co-supervisor along with the Supervisor; one of them should be the teacher of the University and the other a Teacher/Scientist/Research Officer/Director of the Institution\* where the candidate is actually working.

\* Includes Institutions and Laboratories run and sponsored by the Union/State Governments or its agencies; and Foreign University/Institution of repute.

Provided also a candidate may be permitted to carry out his/her research/experimental work in a Research Institution/Research Laboratory/Laboratory of a University recognized by the University for the purpose under the supervision of a Scientist/Director/Teacher of the Institution who may or may not be the Co-supervisor of the candidate.

#### **11.0 Supervisor/Co-supervisor**

**11.1** The person recommended as Supervisor/Co-supervisor to guide the Research Scholar must be:

A Professor in a University Teaching Department/School of Studies with at least five (5) published research papers in UGC Care approved/SCI indexed/ Refreed Journals in Scopus Database.

OR

A Reader/Associate Professor of the University/ a Professor, Associate Professor/Reader in a College/Institution affiliated to the University possessing a Doctorate Degree and has published three (03) research papers in UGC Care approved/SCI indexed/ Refreed Journals in Scopus Database.

Provided that in areas/disciplines where there is no or only a limited number of refereed Journals, the university may relax the above condition for recognition of a person as Research Supervisor/Co-supervisor in consultation with RDC/ Academic Committee/ Council with reasons recorded in writing.

OR

A Lecturer/Assistant Professor of the University Teaching Department/School of Studies/Colleges affiliated to the University who has obtained a Doctorate Degree in the subject and has published at least three (3) Research papers in UGC Care approved/SCI

indexed/ Refereed Journals in Scopus Database and has at least two years of Post Ph.D. experience.

However, in order to encourage research interest among teachers of this category, exemption from two years of Post Ph.D. experience shall be granted to those who have been awarded with research projects of not less than Rs. 5 Lacs from the State (such as CGCOST, etc.)/ National (such as DST, CSIR, UGC, etc.)/ International (such as WHO, Ford Foundation, etc.) Sponsoring Agencies.

OR

A Scientist/ Director not below the rank of a University Lecturer/ Assistant Professor, working in a State or Central Research Institute/ Organization/ Establishment/ Laboratory recognized by the University as a research centre, who has obtained a Doctorate Degree in the subject and published at least three (3) research papers on concerned subject in UGC Care approved/SCI Journals/ in Scopus Database or having at least Two Indian Patents/One International Patent and has five years of experience in the respective field.

- 11.2** Scientists in the regular service in research laboratories of Central/State Government located generally in the geographical jurisdiction of University may also be approved as Research Supervisor/Co Supervisor and the Scientist in Grade-D, Grade-E and Scientist Grade F & G are equated as Assistant Professor, Associate Professor and Professor respectively, exclusively for the purpose of research supervision, subject to fulfillment of other requirements stipulated in these Regulations.
- 11.3** Provided that a recognized Supervisor who fails to publish at least two research papers during last five years in UGC Care approved/SCI Journals/ in Scopus database, shall not be eligible to enroll a new candidate under his/ her supervision.
- 11.4** Provided that the persons who have been recognized as Supervisors/ Co-supervisors shall not be eligible to supervise after their superannuation though they would continue to Supervise already registered candidates with them prior to their superannuation. However, in this case the superannuated faculty, with the permission of the Chairman of DRC, shall have to opt for an additional Co-supervisor, who is in service, from the relevant research center approved by the University.

*Provided also a recognized Supervisor/Co-supervisor under the repealed ordinance shall continue to be recognized as Supervisor/Co-supervisor.*

(Publication means full research paper only, not any technical note or short paper).

The Co- supervisor can be from outside the jurisdiction of the university as well.

- 11.5** The Supervisor should be a Regular Faculty Member of an affiliated Institute of University (within the University).

The external Supervisors are not allowed. However, Co-supervisor can be allowed with the approval of the RDC on recommendation of DRC in inter-disciplinary areas from any Institute/ Organization/Laboratory within or out of University/ Foreign University with good Academic record having at least 5 publications in UGC Care approved/SCI indexed / Refreed Journals in Scopus Database.

- 11.6** Provided further that a person who is himself registered for Ph.D. degree of the University in the subject shall not be eligible to act as Supervisor/Co-supervisor in the concerned subject or member of the DRC/RDC related to the concerned subject mentioned in this Ordinance.

- 11.7** A full time regular teacher, satisfying all conditions of Ordinance and working in a department of a college/centre affiliated to University which is not a recognized research Centre in his/her discipline, and working as a Research Supervisor at a nearby research Centre of the University in the same discipline, shall be permitted to continue with existing students by appointing a Co-supervisor at the Research Centre.

- 11.8** A Professor as Research Supervisor/Co-supervisor, at any given point of time, shall guide not more than 8 (Eight) Ph.D. scholars. An Associate Professor as Research Supervisor shall guide up to a maximum of 6 (Six) Ph.D. scholars and an Assistant Professor as Research Supervisor shall guide up to a maximum of 4 (Four) Ph.D. scholars. Detailed break-up is shown in table below:

Sl. No.	Designation	Solely	Jointly	Sl. No.	Designation	Solely	Jointly	
1	Professor	5	3	2	Associate Professor/Reader	3	3	
		4	4			2	4	
		3	5			1	5	
		2	6			0	6	
	0	xxxx	1	7	3	Assistant Professor/Lecturer	2	2
			0	8			1	3
			0	xxxx			0	4

- 11.9** If a research student under a Research Supervisor submits his/her Ph.D. thesis for adjudication, the date of submission of Ph.D. thesis will be considered as date of occurrence of vacancy under that Research Supervisor in order to avoid delay in granting registration for new research scholar.
- 11.10** In case of a teacher being transferred among colleges under govt./corporate/same management, affiliated to the University, the recognition of the teacher as research guide at research center shall be continued for the existing candidate. In such cases, a Co-supervisor is to be engaged at the research centre.
- 11.11** The research data, in case of **relocation of the woman scholar** for Ph.D. due to marriage or otherwise, shall be allowed to be transferred to the University to which the scholar intends to relocate, provided all the other conditions in this ordinance are followed in letter and spirit and the research work does not pertain to the project secured by the parent institution/Supervisor from any funding agency. The scholar shall give due credit to the original Research Supervisor and the institution for the part of research already done.
- 12.0 Research Center**
- 12.1** Any Institution/College affiliated to University/Research laboratory of State/ Central Government or Government undertaking may apply for getting the recognition as research center for carrying out Ph.D. Degree programme on depositing the required fees for the same.
- 12.2** The teaching department/Center/School of university/affiliated college/institution, organization will be recognized as a Research Center based on the recommendations of a committee formed for this purpose taking care of availability of eligible Research Supervisor, required infrastructure and supporting administrative & research promotion facilities.
- 12.3** All teaching/research departments/centers of the University are deemed to be research centers of this University. However, the University will have the right to make surprise visit and if not found updated for the purpose of carrying out research programme, the organization/institution may be de-recognized as a Research Centre.
- 12.4** Post-graduate Departments of affiliated Colleges and Research Institutes/laboratories of Central/State Government with at least two Ph.D. qualified teachers/scientists in the Department concerned along with required infrastructure, supporting administrative and research promotion facilities as per these Regulations, stipulated under sub-clause 12.5, shall be considered eligible to offer Ph.D. programmes, provided other conditions specified by the University are fulfilled.

12.5 Post-graduate Departments of affiliated Colleges and Research Institutes/laboratories of Central/State Government with adequate facilities for research as mentioned below shall be allowed to offer Ph.D. programs:

- (a) In case of science and technology disciplines, exclusive research laboratories with sophisticated equipment as specified by the University with provision for adequate space per research scholar along with computer facilities and essential licensed software if relevant to the discipline.
- (b) Earmarked library resources including latest books, International & National Journals of relevant field (at least 5), e-journals, extended working hours for all disciplines, adequate space for research scholars in the Department/Library for reading, writing and storing study and research materials.
- (c) Colleges may have access to required facilities of the neighboring Institutions/Colleges /R & D Laboratories.
- (d) Research Centers granted approval by the University prior to the date of effect of this ordinance, shall be permitted to remain as the research center and to retain the research scholars who have applied for their registration prior to date of commencement of this ordinance in force and continue their registration.

12.6 Permission for the Research Center shall be for a maximum of 3 Years. If the Institute/Organization is interested to continue the research center, it shall have to reapply for fresh permission in the prescribed format, along with previous progress report, at least One (01) month before the expiry of registration period together with the fee as prescribed by the University.

### 13.0 Duration of Ph.D. Work

- (a) The candidate shall pursue his/her research at the approved research center under the Supervisor/Co-supervisor/s on the approved subject and topic.

**Full Time Candidate:** The candidate shall be permitted to submit his/her thesis not earlier than 36 months including course work and not later than six calendar years from the date of registration.

**Part Time Candidate:** The candidate shall be permitted to submit his/her thesis not earlier than 48 months including course work and not later than seven calendar years from the date of registration.

In case a candidate does not submit his/her thesis within Six (06) Calendar years (Full Time Candidate) & Seven (07) Calendar Years (Part Time Candidate), from the date of registration and does not apply for extension on time, his/her registration shall stand automatically cancelled. Provided that the period for submission of thesis can be extended by One (01) Year by the Kulpati/Vice Chancellor, if he/she applies for extension within one month after the expiry of registration period together with the prescribed fee. In case the candidate does not submit his/her thesis within the extended period, his/her registration shall stand automatically cancelled.

Provided also that Kulpati/Vice Chancellor may permit a candidate to get re-registered on the same topic on payment of the prescribed re-registration fee. The minimum period of 36 months and attendance shall not apply to such re-registered candidate.

- (b) A minimum of 75% of attendance is to be maintained by a Full Time Candidate except in the cases where longer leave has been duly sanctioned within the leave entitlement of the candidate. The Part Time candidate shall put in at least 60 days of attendance per year (at least 3 days in a month) excluding attendance he/she will earn during the course work, in the Institution/Research Center and he/she shall be required to submit certificate of his periodic availability at the research center from his Employer to justify his/her attendance.
- (c) The Women candidates and Persons with Disability (more than 40% disability) may be allowed a relaxation of two years for Ph.D. in the maximum duration. In addition, the women candidates may be provided Maternity Leave/Child Care Leave once in the entire duration of M. Phil./Ph. D. for up to 240 days.

#### **14.0 Change of Supervisor/ Change of Topic/ Change of Title**

- 14.1** The candidate may be allowed to change the topic, title or the Supervisor/s by applying to the Kulpati/Vice Chancellor for this purpose under special circumstances. No major change in the topic of research will be permitted due to change in Supervisor.
- 14.2** The application, for change of topic or title, in the prescribed format, after getting it endorsed by Supervisor/Co-supervisor, should be submitted by candidate to Chairman, DRC. The topic or title approved by DRC should appear on the final Thesis.
- 14.3** For change of Supervisor, the candidate should apply in standard format (can be taken from website) along with the letters of No Objection from both, old and proposed Supervisor/s, bio-data of new Supervisor and relevant documents.

**14.4** After commencement of research work, if the sole Supervisor leaves the University, a Co-supervisor shall be appointed from the approved list with the University. The original Supervisor shall continue as his/ her main Supervisor of the research work.

**15.0 Six-monthly progress Report**

The candidate shall submit every six months a record of attendance, receipt of fees paid and progress report of the work through his/ her Supervisor in the prescribed format. If the progress of work is not found to be satisfactory in two successive reports or no report is received for a period of one year or the candidate fails to deposit the prescribed fees, the Kulpati/Vice Chancellor may order for cancellation of Registration of the research scholar on recommendation of related committee.

**16.0 Submission of Summary of Thesis**

- (a) Prior to submission of the thesis, the candidate shall make a pre-Ph.D. presentation at the University premises before the DRC that may be open to all faculty members and research students, for getting feedback and comments, which may be suitably incorporated into the draft thesis under the advice of the Supervisor.
- (b) The candidate shall submit Six copies of the summary of the thesis together with a list of at least two (2) research papers published or accepted for publication in the **unpaid** UGC Care approved/SCI journals/ in Scopus Indexed database *along with report of Plagiarism* through his/her Supervisor to the Registrar about two months prior to the anticipated date of submission of the thesis. The Maximum permissible limit of Plagiarism will be specified by University from time to time.
- (c) A maximum of three chances will be given to the research scholar if the percentage of Plagiarism exceeds the approved specified limit. After removing the Plagiarism material, the soft copy of the thesis should be submitted by the research scholar for second or third verification within one (1) month itself along with the related recent report of Plagiarism.
- (d) The Academic Council (or its equivalent body) of the Institution shall evolve a mechanism using well developed software and gadgets to **detect plagiarism** and other forms of academic dishonesty. While submitting for evaluation, the thesis shall have an undertaking from the research scholar and a certificate from the Research Supervisor attesting to the originality of the work, vouching that there is no Plagiarism and that the work has not been submitted for award of any other degree/diploma of the same Institution where the work was carried out, or to any other National or International Institution.
- (e) The Supervisor & Chairman, Board of Studies (BoS) shall submit independently a panel of at least six names of examiners each in a sealed cover to the Registrar *(after getting*

*clearance from committee framed for checking Plagiarism*). The proposed examiners should be actively engaged in the concerned area of research not below the rank of University Associate Professor or College Professor from outside the jurisdiction of the State. Provided that the panel of examiners shall be obtained from a Senior Professor nominated by Kulpati/Vice Chancellor, in case the candidate is related to the Supervisor.

- (f) The term "relations" shall include: Father, Mother, Wife, Husband, Daughter, Son, Grand Son, Grand Daughter, Brother, Sister, Nephew, Niece, Grand Nephew/Niece, Uncle, Aunt, Son-in law, Sister-in law, Father-in-law, First cousin-in-law, etc.
  - (g) The Kulpati/Vice Chancellor shall appoint two Examiners from outside the state out of the panels submitted separately by the Supervisor and Chairman, Board of Studies (BoS).
  - (h) The consent of the examiners shall be obtained by sending them the extended abstract and list of publications.
- 17.0 The candidate shall submit three hard copies of his/her thesis along with soft copy (in form of CD), with the following:
- (a) The candidate shall have to produce evidence of publication of two research papers (or evidence of acceptance for publication) based on this his /her thesis work in UGC Care approved/SCI/Scopus Indexed Journals. Such evidence (reprints of publications or acceptance letter for publication) has to be appended at the end of the thesis.
  - (b) The thesis must be accompanied by a declaration from the candidate that the thesis embodies his/her own work and he/she has worked under the Supervisor at the approved Research Center for the required period as per provisions of the Ordinance.
  - (c) The certificate from the Supervisor together with Co-supervisor, if any, that the thesis fulfills the requirements of the Ordinance relating to the Ph.D. degree of the University is to be attached.
  - (d) The candidate shall also remit with the thesis the prescribed examination fee.
  - (e) Submission of Electronic copy of the Thesis/ Dissertation (ETD) is mandatory at the time of submission of the Ph. D. thesis. The University shall submit a soft copy to UGC within a period of fifteen days after the award of the degree, for hosting the same in INFLIBNET, accessible to all Institutions/ Universities.
  - (f) The thesis must follow the guidelines of the University for writing the Ph. D. Thesis.
  - (g) Thesis should be typed on one side of a page.

- (h) The Final Thesis shall be typeset in English language using standard computer Softwares like MS-word, Latex, etc.

**18.0 Evaluation Procedures following Submission of the Thesis**

On receipt of the thesis along with no dues certificate and required fee, the thesis shall be sent to Two examiners already consented.

**19.0** The thesis to be accepted for the award of the Ph.D. degree must comply with the following conditions.

- (a) It must be a piece of research work characterized either by the discovery of the facts or by a fresh approach towards the interpretation of facts or an innovative application in the area of engineering & technology. In either case it should evince the candidate's capacity for critical examination and sound judgment.

- (b) It must be satisfactory in point of language and presentation of the subject matter.

**20.0** The examiners shall categorically recommend in the prescribed proforma for acceptance, revision or rejection of the thesis together with detailed comments on the points spelled out in the Ordinance. The individual examiner must also give a list of at least 10 questions he/she wishes to ask at the viva-voce examination.

**21.0 (a)** The examiners may seek clarification of the subject matter of the thesis from the Supervisor through the Registrar. The provision will be incorporated in the letter to be sent to the examiners while sending the thesis.

- (b) The Kulpati/Vice Chancellor can recall the thesis from an examiner who fails to send the report within two months of the date of dispatch of the thesis and appoint another examiner.

**22.0 (a)** In case both the examiners reject the thesis or one of them rejects the thesis and the other recommends a revision the thesis shall be rejected.

- (b) If both the examiners recommend for the revision of the thesis the candidate shall be called upon to revise the thesis in the light of the observations of the examiners.

- (c) If one examiner approves the thesis and the other rejects it or recommends for revision, the thesis shall be sent to the third examiner drawn from the panel of the examiners by Kulpati/Vice Chancellor. The opinion of the third examiner shall be final.

- (d) In case both the original examiners accept the thesis for the award of the Ph.D. Degree or in the event of it being referred to the third examiner, the third examiner accepts the thesis for the award of Ph.D. degree, the candidate shall be called upon to

appear at the viva-voce examination before a board of examiners comprising of the Supervisor, Co-supervisor (if any) and one of the two examiners selected by the Kulpati/Vice Chancellor who has accepted the thesis for the award of the Ph.D. Degree. Provided that the Kulpati/Vice Chancellor shall appoint the Chairman, DRC or Chairman, Board of Studies of the subject concerned to act as viva-voce examiner, in place of the Supervisor in case the candidate is related to the Supervisor.

- (e) The Supervisor, Co-supervisor, Chairman of DRC, Dean of the Concerned Faculty, Chairman of Board of Studies of the subject concerned, as the case may be, shall be communicated the date of the viva voce. The external examiner will be appointed by the Kulpati/Vice Chancellor to conduct the viva-voce examination at the University. Provided in special circumstances, Kulpati/Vice Chancellor may appoint alternate viva-voce examiners if both the examiners are not in a position to conduct the viva-voce examination.
  - (f) The date, time and venue of viva-voce examination at the University shall be notified by the Registrar of the University under intimation to the Supervisor, Co-supervisor, the Candidate, Chairman of DRC, Dean of the Concerned Faculty, Chairman (BoS), at least a week in advance. The Supervisor in consultation with external examiner should fix the date of viva-voce examination. At the time of viva-voce examination the board of examiners shall be provided with the reports of the examiners which shall be returned along with the report of viva-voce examination and record of attendance of the examination to the Registrar.
  - (g) The candidate shall present the work embodied in the thesis before the board of examiners, members of the faculty, research scholars and other interested persons. After the presentation of the research work the Board shall ask questions together with those questions which have been provided along with the reports of the examiners. Others in the audience can also ask questions and the candidate shall reply only those questions permitted by the external examiner.
  - (h) In case the recommendation of the viva-voce examiner differs from that of the thesis examiner or there is difference of opinion between the viva-voce examiners, the candidate shall re-appear at a second viva-voce examination within six months. If the candidate fails to satisfy the viva-voce examiners a second time, his/her thesis shall be finally rejected. Such candidates would be required to pay the prescribed additional fee for the second viva-voce. The external examiner for second viva-voce shall be appointed by the Kulpati.
- 23.0 (a) If the examiners recommend that the candidate be asked to revise/improve his/her thesis, the Kulpati/Vice Chancellor shall permit the candidate to resubmit his/her thesis not earlier than six months and not later than eighteen months the period being

counted from the date of the issue of order to the candidate. The candidate shall be provided examiner(s) reports without disclosing the names of the examiners to enable him/her to improve the thesis. All the copies of the thesis shall be returned to the candidate.

(b) In case the candidate is allowed to resubmit the thesis he/she will have to pay the prescribed fee afresh at the time of resubmission, but it shall not be necessary for him to reproduce any certificate of further attendance at the institution at which he/she carried out the work. The resubmitted three copies of the thesis must make clear mention that it is a revised version.

(c) The thesis shall be got examined as far as possible, by the examiners who recommended the revision.

(d) In case a candidate is asked to revise and one of the examiners recommends again for revision and the other accepts the thesis for award then the thesis shall be sent to the third examiner. If the third examiner rejects or recommends for revision, the thesis shall stand rejected. In case the third examiner accepts for award of Ph. D. degree, then the candidate shall be awarded the Ph. D. degree on completion of successful viva-voce examination.

(e) If the revised thesis required to be revised a second time it shall automatically stand rejected.

24. No research scholar shall join any other course of study or appear at any other examination conducted by any University leading to a degree (except Certificate/Diploma course of languages, Research Methodology, Statistics, and Computer Science).

25. The candidate, if so desires, is allowed to publish his/her thesis subject to prior permission of the University. However, such publication shall state on the title page itself that this was a thesis approved for the award of the Ph.D. degree of the University.

26. The University is the owner of the copyright of Ph.D. thesis.

27. After the successful viva-voce, the Vice Chancellor shall have powers to issue Notifications for the award of Ph.D. degree to the candidate and the matter shall be reported to the Executive Council for their approval in its forthcoming meeting. One copy of the thesis will be kept in the University Library and another copy will be kept in the Departmental Library of the Institution where the research work was carried out; the third will be returned to the Supervisor.

Award of Degrees to candidates registered for Ph.D. program on or after May 05, 2016 till the date of Notification of these regulations shall be governed by the provisions of the UGC (Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degrees) Regulations, 2016.

The University shall issue a Provisional Certificate to each scholar, prior to the actual award of the Degree, to the effect that the Degree has been awarded in accordance with the provisions of the UGC (Minimum Standards and procedure for Awards of M.Phil./Ph.D. Degree) Regulations 2016.

If the M.Phil./Ph.D. Degree is awarded by a Foreign University, the Indian Institution considering such a degree shall refer the issue to a Standing Committee constituted by the concerned institution for the purpose of determining the equivalence of the degree awarded by the Foreign University.

28. After the declaration of the result, the candidate on payment of prescribed fee may be provided with the copies of the reports of examiners who recommended for the award of the Ph.D. degree on payment of the prescribed fee. The reports will not disclose the identity of the examiners.
29. The candidates who have been already registered for Ph. D. degree under the repealed/previous Ordinance shall continue to be governed by the provision of the repealed/previous Ordinance.
30. The candidates who have applied for registration but have not been registered till this Ordinance comes into force shall be governed by the provisions of this Ordinance.
31. On detection of any irregularity, the University shall take suitable steps to withdraw the degree as per the provisions of the Ordinance & Statute of the University.
32. In all the cases, Kulpati/Vice Chancellor shall have powers to condone the time limit up to six months for valid reasons to be recorded therein for the cases not covered in this Ordinance.
33. The Institutions shall develop appropriate methods so as to complete the entire process of evaluation of Ph.D. Thesis within a period of Six Months from the date of submission of the dissertation/thesis.
34. For the cases not covered in this Ordinance, the UGC Regulations 2016 (Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degrees) is to be referred/followed.

35. For specific/ special cases not taken up in this Ordinance, the Kulpati/Vice Chancellor has the power to decide.

\* Approval accorded on \_\_\_\_\_ by Chancellor's office



## Chhattisgarh Swami Vivekanand Technical University, Bhilai

### List of Approved Research Centers

Sl. No.	Name of Research Centers	Name of discipline
1	<b>University Teaching Department (UTD) CSVTU, Bhilai P.O Newai Distt-Durg (C. G.) PIN-491107</b>	Bio-Medical Engineering
		Biotechnology
		Civil Engineering
		Computer Application
		Computer Science and Engineering
		Electrical Engineering
		Electrical and Electronics Engineering
		Electronics and Instrumentation
		Electronics and Telecommunication
		Information Technology
		Mechanical Engineering
		Management
		Pharmacy
		Water Resource Engineering
		Environmental Engineering
Architecture		
2	<b>Vishvidhyalaya Engineering College (VEC), Ambikapur</b>	Applied Chemistry
		Applied Mathematics
		Applied Physics
		Civil Engineering
		Computer Science Engineering
		Mechanical Engineering
3	<b>Bhilai Institute of Technology, Durg Bhilai House, GE Road, Durg (C.G) PIN-491001</b>	Applied Chemistry
		Applied Mathematics
		Applied Physics
		Civil Engineering
		Computer Application
		Computer Science Engineering
		Electrical Engineering
		Electronics & Telecommunication
		Mechanical Engineering
		Management



## Chhattisgarh Swami Vivekanand Technical University, Bhilai

### List of Approved Research Centers

Sl. No.	Name of Research Centers	Name of discipline
4	<b>Shri Shankaracharya Technical Campus, (Shri shankaracharya Group of Institutions) Junwani, Bhilai</b> <b>P.O. Junwani Distt.-Durg</b> <b>PIN-490020(C.G)</b>	Applied Chemistry
		Applied Mathematics
		Applied Physics
		Civil Engineering
		Computer Application
		Computer Science Engineering
		Electrical Engineering
		Electrical & Electronics Engineering
		Electronics & Instrumentation
		Electronics & Telecommunication
		Information Technology
		Mechanical Engineering
Management		
5	<b>Rungta College of Engineering &amp; Technology, Bhilai</b> <b>P.O. Kohka-Bhilai Distt.-Durg (C.G)</b> <b>PIN-490023</b>	Applied Chemistry
		Applied Mathematics
		Applied Physics
		Computer Application
		Computer Science Engineering
		Electrical Engineering
		Electronics & Telecommunication
		Mechanical Engineering
		Humanities
Management		
6	<b>RSR-Rungta College of Engineering &amp; Technology, Bhilai P.O. Kohka-Bhilai Distt.-Durg (C.G) PIN-490023</b>	Computer Science Engineering
7	<b>Raipur Institute of Technology, Raipur Mandir Hasaud Road, Raipur (C.G) PIN-492101</b>	Biotechnology
		Mechanical Engineering
		Applied Chemistry
		Management



**Chhattisgarh Swami Vivekanand Technical University, Bhilai**  
**List of Approved Research Centers**

Sl. No.	Name of Research Centers	Name of discipline
8	Chhatrapati Shivaji Institute of Technology, Durg P.O. Pisegaon, Distt.-Durg (C.G) PIN-491001	Computer Application
		Computer Science Engineering
		Mechanical Engineering
9	Christian College of Engineering & Technology, Bhilai Kailash Nagar Near Industrial Estate, Bhilai Distt.-Durg (C.G) PIN-490026	Electronics & Telecommunication
		Applied Mathematics
		Applied Physics
10	Government Engineering College, Jagdalpur Darampura, Jagdalpur PIN-494001	Applied Mathematics
		Applied Physics
		Electronics and Telecommunication
		Mechanical Engineering
11	Government Engineering College, Raipur Sejbahar, Old Dhamtari Road, Raipur, Chhattisgarh PIN-492015	Applied Chemistry
		Applied Mathematics
		Civil Engineering
		Electrical and Electronics Engineering
		Electronics and Telecommunication
		Mechanical Engineering
12	Government Engineering College, Bilaspur Koni, Bilaspur (C. G.) PIN-495009	Civil Engineering
		Electrical Engineering
		Electronics and Telecommunication
		Mechanical Engineering
13	Bhilai Institute of Technology, Raipur Kendri, New Raipur, National Highway (NH 30), Near Abhanpur, Raipur (C. G.). PIN-493661	Mechanical Engineering
14	Shri Shankaracharya Institute of Professional Management and Technology, Old Dhamtari Road, P.O. : Sejbahar, Mujgahan, Raipur, Chhattisgarh Pin Code: 492015	Applied Physics
		Computer Science and Engineering
		Management



**Chhattisgarh Swami Vivekanand Technical University, Bilai**  
**List of Approved Research Centers**

Sl. No.	Name of Research Centers	Name of discipline
15	Columbia Institute of Pharmacy, Raipur Vidhansabha Road, P.O-Girod Distt.-Raipur PIN-493111	Pharmacy
16	School of Studies – Pharmacy (Chouksey Engineering College Bilaspur) Masturi Road, NH-49 Bilaspur (C.G) PIN-495004	Pharmacy
17	Shri Rawatpura Sarkar Institute of Pharmacy, Kumhari, Durg P.O. Kumhari, Distt.-Durg (C.G) PIN-490042	Pharmacy
18	Shri Shankaracharya Technical Campus Junwani Bilai (Faculty of Pharmaceutical Sciences) P.O. Junwani Distt.-Durg (C.G) PIN-490020	Pharmacy
19	Rungta College of Pharmaceutical Sciences and Research, Bilai P.O. Kohka-Bilai Distt.-Durg (C.G) PIN-490023	Pharmacy
20	University College of Pharmacy, Raipur (C.G.)	Pharmacy
21	Sickle Cell Institute Chhattisgarh, Raipur. (Pt. J N Memorial Medical College, Raipur) Jail Road, Raipur (C.G) PIN-492001	Biotechnology
22	Chhattisgarh Institute of Medical Sciences (CIMS) Sardar Vallabh Bhai Patel Hospital, Bilaspur (Chhattisgarh) PIN-495009	Biotechnology



## Chhattisgarh Swami Vivekanand Technical University, Bhilai

### Provisional Vacant Position under Supervisors 2023

Published List is completely provisional and it has been prepared on the basis of information provided by the institute and verified with modified Ordinance No. 10.

Sl.No.	Subject/Branch	Name of Supervisor (Provisional)	Designation	Institute Name	Vacancy
1	Applied Chemistry	1 Dr. Supriya Biswas	Professor	SSTC, Bhilai	4
		3 Dr. Madhurima Pandey	Professor	BIT, Durg	7
		4 Dr. Santosh Kumar Sar	Professor	BIT, Durg	4
		7 Dr. Rekha Trivedi	Associate Professor	SSTC, Bhilai	6
		9 Dr. Sangeeta Sahu	Associate Professor	BIT, Raipur	6
		10 Dr. Sumita Nair	Associate Professor	BIT, Durg	6
		11 Dr. Rakesh Singh Dhundhel	Associate Professor	SSIPMT, Raipur	6
		12 Dr. Yashu Verma	Assistant Professor	BIT, Durg	3
		13 Dr. Preeti Nandkumar	Associate Professor	CCET, Bhilai	6
		16 Dr. R. K. Sahu	Assistant Professor	VEC, Ambikapur	5
		17 Dr. B. C. Sahu	Assistant Professor	VEC, Ambikapur	4
		18 Dr. Shilpa Sharma	Assistant Professor	BIT, Raipur	5
2	Applied Physics	1 Dr. M.L. Verma	Professor	SSTC, Bhilai	5
		2 Dr. Mimi Akash Pateria	Professor	SSTC, Bhilai	8
		3 Dr. D.S. Raghuvanshi	Professor	SSTC, Bhilai	8
		4 Dr. Ruby Das	Professor	BIT, Durg	7
		5 Dr. Samit Tiwari	Professor	BIT, Durg	8
		6 Dr. H.L.Vishwakarma	Professor	GEC, Jagdalpur	7
		7 Dr. B. Keshav Rao	Associate Professor	SSTC, Bhilai	6
		8 Dr. Raunak Tamrakar	Assistant Professor	BIT, Durg	4
		9 Dr. Prashant Kumar Sahu	Assistant Professor	BIT, Durg	4
		10 Dr. Homendra Sahu	Assistant Professor	SSTC, Bhilai	4
		11 Dr. K.K. Pathak	Assistant Professor	RIT, Raipur	4
		12 Dr. Anju Singh	Assistant Professor	CCET, Bhilai	4
		13 Dr. Neha Sharma	Assistant Professor	VEC, Ambikapur	4
3	Applied Maths	1 Dr. Sanjay Sharma	Professor	BIT, Durg	6
		2 Dr. Mithilesh Deo Pandey	Professor	BIT, Durg	5
		3 Dr. M. M. Singh	Professor	SSTC, Bhilai	5
		4 Dr. Manoj Kumar Chande	Professor	SSIPMT, Raipur	5

Sl.No.	Subject/Branch	Name of Supervisor (Provisional)	Designation	Institute Name	Vacancy
3	Applied Maths	5 Dr. Dilip Kumar Das	Professor	CCET, Bhilai	6
		6 Dr. Jaindra Jain	Professor	GEC, Jagdalpur	5
		7 Dr. Anil kumar Dubey	Associate Professor	BIT, Durg	3
		8 Dr. Anindita Chakraborty	Associate Professor	BIT, Durg	5
		11 Dr. Dharmendra Kumar Gangeshwar	Associate Professor	BIT, Durg	2
		12 Dr. Pranjali Sharma	Associate Professor	SSIPMT, Raipur	3
		13 Dr. Manoj Kumar Dewangan	Associate Professor	SSIPMT, Raipur	6
		15 Dr. h.r. Suryavanshi	Assistant Professor	VEC, Ambikapur	4
		16 Dr. Urmila Mishra	Assistant Professor	VEC, Ambikapur	4
		18 Dr. Vijay Kumar Dwivedi	Assistant Professor	VEC, Ambikapur	4
4	Computer Application	1 Dr. Sanjeev Karmakar	Associate Professor	BIT, Durg	4
5	Civil Engineering	1 Dr. Alok Kumar Jain	Professor	SSIPMT, Raipur	8
		2 Dr. Sindhu J. Nair	Professor	BIT, Durg	2
		3 Dr. S. K. Jaiswal	Professor	BIT, Durg	2
		4 Dr. G.P.Khare	Professor	GEC, Jagdalpur	8
		5 Dr. Shri Ram Krishan Mishra	Associate Professor	BIT, Raipur	2
		6 Dr. R. N. Khare	Principal	VEC, Ambikapur	6
		7 Dr. N. P. Dewangan	Assistant Professor	VEC, Ambikapur	4
		8 Dr. R.B. Malathy	Assistant Professor	SSIPMT, Raipur	4
		9 Dr. Ravindra Sharma	Assistant Professor	KEC, Bhilai	4
		10 Dr. Tarun Kumar Rajak	Assistant Professor	SSIPMT, Raipur	4
6	Computer Science & Engineering	1 Dr. Sunita Soni	Professor	BIT, Durg	2
		2 Dr. Jyotiprakash Patra	Professor	SSIPMT, Raipur	0
		3 Dr. Padma Bonde	Professor	SSTC, Bhilai	6
		4 Dr. Samta Gajbhiye	Associate Professor	SSTC, Bhilai	3
		5 Dr. Abha Choubey	Associate Professor	SSTC, Bhilai	4
		6 Dr. Siddhartha Choubey	Associate Professor	SSTC, Bhilai	2
		7 Dr. Rakesh Kumar Khare	Associate Professor	SSTC, Bhilai	6
		8 Dr. Padmavati Shrivastava	Associate Professor	BIT, Raipur	6
		9 Dr. Megha Mishra	Associate Professor	SSTC, Bhilai	2
		10 Dr. Partho Roy	Associate Professor	BIT, Durg	1
		11 Dr. Archana Choudhary	Associate Professor	CCET, Bhilai	6
		12 Dr. D.P.Mishra	Associate Professor	BIT, Durg	5
		13 Dr. Pawan Kumar Patnaik	Assistant Professor	BIT, Durg	1
		14 Dr. Suman Kumar Swarnkar	Assistant Professor	SSIPMT, Raipur	4

Sl.No.	Subject/Branch	Name of Supervisor (Provisional)	Designation	Institute Name	Vacancy
6	Computer Science & Engineering	15 Dr. Avinash Dhole	Assistant Professor	SSTC, Bhilai	4
		16 Dr. Sonu Agrawal	Assistant Professor	SSTC, Bhilai	4
		17 Dr. Dipti Verma	Assistant Professor	VEC, Ambikapur	3
7	Electrical and Electronics Engg.	1 Dr. Anup Mishra	Professor	BIT, Durg	7
		2 Dr. Abhishek Verma	Professor	BIT, Durg	8
		3 Dr. Shimpay Ralhan	Professor	SSTC, Bhilai	5
		4 Dr. Mahesh Singh	Assistant Professor	SSTC, Bhilai	3
		5 Dr. Achala Jain	Assistant Professor	SSTC, Bhilai	3
		6 Dr. Rajkumar Jhapte	Assistant Professor	SSTC, Bhilai	4
8	Electrical Engg.	1 Dr. S. P. Shukla	Professor	BIT, Durg	3
		2 Dr. Nagendra Tripathi	Professor	BIT, Durg	5
		3 Dr. Supriya Tripathi	Professor	BIT, Durg	6
		4 Dr. Anupama Huddar	Professor	BIT, Durg	4
		5 Dr. Archana Gupta	Professor	BIT, Durg	6
		6 Dr. Shailendra Verma	Assistant Professor	CCET, Bhilai	4
		7 Dr. Shruti Tiwari	Assistant Professor	SSTC, Bhilai	4
9	Electronics and Telecommunication	1 Dr. Manisha Sharma	Professor	BIT, Durg	8
		2 Dr. Arun Kumar		BIT, Durg	2
		3 Dr. Dipali soren	Professor	CCET, Bhilai	4
		4 Dr. Shrikant Burje	Associate Professor	CCET, Bhilai	6
		5 Dr. Vinay Kumar Singh	Associate Professor	GEC, Jagdalpur	2
		6 Dr. Sanjay Kumar Dekate	Associate Professor	GEC, Jagdalpur	8
		7 Dr. Hemlata Sinha	Associate Professor	SSIPMT, Raipur	6
		8 Dr. Md. Khaja Mohiddin	Assistant Professor	BIT, Raipur	3
		9 Dr. Naveen Kumar Dewangan	Assistant Professor	BIT, Durg	4
10	Geology	1 Dr. Ketan Chourasia	Assistant Professor	VEC, Ambikapur	4
11	Humanities	1 Dr. Seema Arora	Associate Professor	SSIPMT, Raipur	4
		2 Dr. Ritu Benjamin	Assistant Professor	SSIPMT, Raipur	4
12	Information Technology	1 Dr. Ani Thomas	Professor	BIT, Durg	0
		2 Dr. Jyoti Pillai	Professor	BIT, Durg	1
13	Management	1 Dr. Sanjay Guha	Professor	BIT, Durg	3
		2 Dr. Sapna Sharma		SSIPMT, Raipur	0
		3 Dr. Ashok Chandra	Associate Professor	BIT, Durg	1
		4 Dr. Satya Vardhan Tiwari	Associate Professor	BIT, Durg	6
		5 Dr. Daljeet Singh Wadhwa	Associate Professor	BIT, Durg	3

Sl.No.	Subject/Branch	Name of Supervisor (Provisional)	Designation	Institute Name	Vacancy	
13	Management	6	Dr. Urvashi Shrivastava	Associate Professor	BIT, Durg	0
		7	Dr. Dalvinder Singh Wadhwa	Associate Professor	SSIPMT, Raipur	5
		8	Dr. Minal Shah	Assistant Professor	BIT, Durg	1
		9	Dr. Judith Gomes	Assistant Professor	BIT, Durg	4
		10	Dr. Robin Thomas	Assistant Professor	VEC, Ambikapur	3
		11	Dr. Abhishek Chakraborty	Assistant Professor	BIT, Durg	4
		12	Dr.Sujit Day	Assistant Professor	RIT, Raipur	4
14	Mechanical Engg.	1	Dr. Pratap B. Deshmukh	Professor	SSTC, Bhilai	4
		2	Dr. Arun Arora	Professor	BIT, Durg	4
		3	Dr. Sheina Shekhar	Professor	BIT, Durg	2
		4	Dr. R. Banchhor	Professor	BIT, Durg	7
		5	Dr. Shubhrata Nagpal	Professor	BIT, Durg	3
		6	Dr. P.S.Rao	Associate Professor	CCET, Bhilai	6
		7	Dr. R.H. Gajghat	Professor	CCET, Bhilai	8
		8	Dr. Himanshu Agrawal	Professor	GEC, Jagdalpur	5
		9	Dr. Mukesh Dubey	Associate Professor	BIT, Durg	6
		10	Dr. Lakshman Sondhi	Associate Professor	SSTC, Bhilai	4
		11	Dr. Naveen Jain	Associate Professor	SSIPMT, Raipur	6
		12	Dr. Ajay Kumar Verma	Associate Professor	SSTC, Bhilai	0
		13	Dr. Anil Sahu	Associate Professor	BIT, Durg	2
		14	Dr. Krishnamurti L. Motghare	Associate Professor	RIT, Raipur	6
		15	Dr. S. C. Gajbhiye	Assistant Professor	VEC, Ambikapur	1
		16	Dr. S. S. K. Deepak	Assistant Professor	BIT, Raipur	3
		17	Dr. Santosh Mishra	Assistant Professor	BIT, Durg	1
		18	Dr. H. S. Chandra	Assistant Professor	VEC, Ambikapur	5
		19	Dr. Sabana Naz Siddique	Assistant Professor	BIT, Durg	4
15	Pharmacy	1	Dr. Deepak Kumar Dash	Professor & Principal	RCP, Raipur	8
		2	Dr. Vibhor Kumar Jain	Professor & Principal	JKIPER, Bilaspur	6
		3	Dr. Sandeep Gupta	Principal	TIPR, Bilaspur	8
		4	Dr. Shiv Shankar Shukla	Professor	CIP, Raipur	3
		5	Dr. Trilochan Satapathy	Professor	CIP, Raipur	8
		6	Dr. Satyabrata Bhanja	Professor	RITEE-COP, Raipur	0
		7	Dr. Surendra Saraf	Principal	CCPR, Raipur	0
		8	Dr. Shruti Rathore	Professor	LCIT-SOP, Bilaspur	7
		9	Dr. D. K. Pradhan	Professor	RCP, Raigarh	8

Sl.No.	Subject/Branch	Name of Supervisor (Provisional)	Designation	Institute Name	Vacancy	
15	Pharmacy	10	Dr. Achal Mishra	Professor	FPS-SSTC, Bhilai	6
		11	Dr. Ajazuddin	Professor	RCPSR, Bhilai	7
		12	Dr. Ravindra Kumar Pandey	Professor & Principal	CIP, Raipur	3
		13	Dr. Anil Kumar Sahu	Associate Professor	RCP, Raipur	6
		14	Dr. Harish Sharma	Associate Professor	RIPSR, Bhilai	6
		15	Dr. Gyanesh Kumar Sahu	Associate Professor	RIPSR, Bhilai	6
		16	Dr. S.Prakash Rao	Associate Professor	CIP, Raipur	3
		17	Dr. Shashikant Chandrakar	Associate Professor	CIP, Raipur	4
		18	Dr. Beena Gidwani	Associate Professor	CIP, Raipur	4
		19	Dr. Ajit Pandey	Associate Professor	FPS-SSTC, Bhilai	6
		20	Dr. Govind Sharma	Associate Professor	FPS-SSTC, Bhilai	6
		21	Dr. Gunjan Jeswani	Associate Professor	FPS-SSTC, Bhilai	6
		22	Dr. Madhulika Pradhan	Associate Professor	RCPSR, Bhilai	6
23	Dr. Ashish Majumdar	Assistant Professor	CCPR, Raipur	0		

**Note:** (1) Provisional Status is mentioned, Final approval shall be decided by the RDC during conducting the meeting after recommendation of DRC.

(2) A recognized Supervisor who fails to publish research paper/ publication (SCI, SCOPUS, UGC approved) over duration of five years shall not be eligible to enroll new candidates under his/her supervision.

(3) Vacant position may vary in the final list.

(4) Application for recognition as Supervisor should be submitted to CSVTU, Bhilai. (If not submitted in previous year)

(5) List has been prepared as per modified ordinance No. 10.



**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI  
PH.D. ENTRANCE EXAMINATION SCHEME, 2023**

**Maximum Marks – 100**

**Duration of Examination – 3 hrs**

**Section – I**

Consisting of 40 objective type questions from relevant discipline of the syllabus.

**Section – II**

Consisting of 60 objective type questions from any of the specialization of the relevant discipline of the syllabus. The weightage for section I shall be 40% & section II shall be 60%.



# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. programme-2023

### Discipline : Civil Engineering

#### Section - I

##### **STRUCTURAL ENGINEERING**

**Mechanics:** Bending moment and shear force in statically determinate beams. Simple stress and strain relationship: Stress and strain in two dimensions, principal stresses, stress transformation, Mohr's circle. Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Thin walled pressure vessels, uniform torsion, buckling of column, combined and direct bending stresses.

**Structural Analysis:** Analysis of statically determinate trusses, arches, beams, cables and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/energy methods, analysis by displacement methods (slope deflection and moment distribution methods), influence lines for determinate structures.

**Concrete Structures:** Concrete Technology - properties of concrete, basics of mix design, Concrete design – basic working stress and limit state design concepts, analysis of ultimate load capacity and design of members subjected to flexure, shear, compression and torsion by limit state methods.

**Steel Structures:** Analysis and design of tension and compression members, beam and beam – columns, column bases. Connections simple and eccentric, beam-column connections, Plastic analysis of beams and frames.

##### **GEOTECHNICAL ENGINEERING**

**Soil Mechanics:** Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships. Permeability & seepage, effective stress principle, consolidation, compaction, shear strength.

**Foundation Engineering:** Sub – surface investigations – scope, drilling bore holes, sampling, penetration tests, plate load test, Earth pressure theories, effect of water table, layered soils, Stability of slopes-infinite slopes, finite slopes. Foundation types – foundation design requirements. Shallow foundations – bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands & clays. Deep foundations – pile types, dynamic & static formulae, load capacity of piles in sands & clays, negative skin friction.

## **WATER RESOURCES ENGINEERING**

**Fluid Mechanics and Hydraulics:** Properties of fluids, principle of conservation of mass, momentum energy and corresponding equations, potential flow, applications of momentum and Bernoulli's equation, laminar and turbulent flow, flow in pipes. Concept of boundary layer and its growth. Uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump. Forces on immersed bodies, flow measurements in channels, tanks and pipes. Dimensional analysis and hydraulic modeling. Kinematics of flow, velocity triangles and specific speed of pumps and turbines.

**Hydrology:** Hydrologic cycle, rainfall, evaporation, infiltration, stage discharge relationships, unit hydrographs, flood estimation, reservoir capacity, reservoir and channel routing. Well hydraulics.

**Irrigation:** Duty, delta, estimation of evapo-transpiration. Crop water requirements. Design of lined and unlined canals, waterways, head works, gravity dams and spillways, Design of weirs on permeable foundation. Types of irrigation system, irrigation methods, Water logging and drainage, sodic soils.

## **ENVIRONMENTAL ENGINEERING**

**Water requirements:** Quality standards, basic unit processes and operations for water treatment, Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards, Domestic wastewater treatment, quantity of characteristics of domestic wastewater, primary and secondary treatment Unit operations and unit processes of domestic wastewater, sludge disposal.

**Air Pollution:** Types of pollutants, their sources and impacts, air pollution metrology, air pollution control, air quality standards and limits.

**Municipal Solid Wastes:** Characteristics, generation, collection and transportation of solid wastes, engineered systems, for solid waste management (reuse/recycle, energy recovery, treatment and disposal).

## **TRANSPORTATION ENGINEERING**

**Highway Planning:** Geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements.

**Traffic Engineering:** Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway capacity.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. programme-2023

### Discipline : Computer Sciences (for CSE, IT, MCA)

#### Section - I

**Computer Architecture:** Architectural classification schemes, Memory models, Pipelining, RISC CISC, VLIW architectures, data dependency, and interconnection network.

**Software Systems:** Data structures and Algorithms: the notion of abstract data types, stack, queue, list, set, string, tree, binary search tree, heap, graph, tree and graph traversals, connected components, spanning trees, shortest paths, hashing, sorting, searching, design techniques (greedy, dynamic, divide and conquer, Algorithm design by induction), asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes – P, NP, NP-hard, NP-complete.

**Programming Methodology:** Scope, binding, parameter passing, recursion, procedure oriented programming – data types and declarations, assignment and control flow statements, 1-d and 2-d arrays, functions, pointers; Concepts of object-oriented programming - classes, objects, inheritance, polymorphism, operator OVERLOADING.

**Operating Systems:** Classical concepts (concurrency, synchronization, deadlock), Distributed Operating System, multithreading, inter-process communication, CPU scheduling, memory management, file systems, I/O systems, protection and security, shell programming.

**Information Systems and Software Engineering:** SDLC, planning and managing the Project, design, coding, testing, implementation, maintenance.

**Databases:** E-R diagrams, object and relational model, database design, integrity constraints, normal forms, query languages (SQL), file structures (sequential, indexed), b- trees, transaction and concurrency control.

**Data Communication and Computer Networks:** ISO/OSI and TCP/IP stacks, transmission media, data encoding, multiplexing, flow and error control, LAN technologies (Ethernet, token ring), network devices – switches, gateways, routers, network security – cryptography, digital signature, firewalls, routing concepts, ATM, Queuing theory – M/M/1 queues, poisson and other distributions.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. programme-2023

### Discipline: Electrical Engineering

#### (Common for Electrical Engg. and Electrical & Electronics Engineering)

#### Section - I

**Electric Circuits and Fields:** Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

**Signals and Systems:** Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

**Electrical Machines:** Single phase transformer - equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers - connections, parallel operation; autotransformer; energy conversion principles; DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors - principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines - performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors, special machines.

**Power Systems:** Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of overcurrent, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS.

**Control Systems:** Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

**Electrical and Electronic Measurements:** Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

**Analog and Digital Electronics:** Characteristics of diodes, BJT, FET; amplifiers - biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers - characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 16 & 8-bit microprocessor basics, architecture, programming and interfacing.

**Power Electronics and Drives:** Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters - fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

**Advanced Topics in Electrical Engineering:** Artificial Neural Network, Fuzzy systems, Neuro-fuzzy systems and genetic algorithms, Simulation tools used in Electrical Engineering.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Electronics and Instrumentation Engineering

#### Section - I

**Basics of Circuits and Measurement Systems:** Kirchoff's laws, mesh and nodal Analysis. Circuit theorems. One-port and two-port Network Functions. Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Statistical analysis of data and curve fitting.

**Transducers, Mechanical Measurement and Industrial Instrumentation:** Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning. Measurement of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock. Measurement of pressure, flow, temperature and liquid level. Measurement of pH, conductivity, viscosity and humidity.

**Analog Electronics:** Characteristics of diode, BJT, JFET and MOSFET. Diode circuits. Transistors at low and high frequencies, Amplifiers, single and multi-stage. Feedback amplifiers. Operational amplifiers, characteristics and circuit configurations. Instrumentation amplifier. Precision rectifier. V-to-I and I-to-V converter. Op-Amp based active filters. Oscillators and signal generators.

**Digital Electronics:** Combinational logic circuits, minimization of Boolean functions. IC families, TTL, MOS and CMOS. Arithmetic circuits. Comparators, Schmitt trigger, timers and mono-stable multi-vibrator. Sequential circuits, flip-flops, counters, shift registers. Multiplexer, S/H circuit. Analog-to-Digital and Digital-to-Analog converters. Basics of number system. Microprocessor applications, memory and input-output interfacing. Microcontrollers.

**Signals, Systems and Communications:** Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first- and second order systems. Convolution, correlation and characteristics of linear time invariant systems. Discrete time system, impulse and frequency response. Pulse transfer function. IIR and FIR filters. Amplitude and frequency modulation and demodulation. Sampling theorem, pulse code modulation. Frequency and time division multiplexing. Amplitude shift keying, frequency shift keying and pulse shift keying for digital modulation.

**Electrical and Electronic Measurements:** Bridges and potentiometers, measurement of R, L and C. Measurements of voltage, current, power, power factor and energy. A.C & D.C current probes. Extension of instrument ranges. Q-meter and waveform analyzer. Digital

voltmeter and multi-meter. Time, phase and frequency measurements. Cathode ray oscilloscope. Serial and parallel communication. Shielding and grounding.

**Control Systems and Process Control:** Feedback principles. Signal flow graphs. Transient Response, steady-state-errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems. Mechanical, hydraulic and pneumatic system components. Synchro pair, servo and step motors. On-off, cascade, P, P-I, P-I-D, feed forward and derivative controller, Fuzzy controllers.

**Analytical, Optical and Biomedical Instrumentation:** Mass spectrometry. UV, visible and IR spectrometry. X-ray and nuclear radiation measurements. Optical sources and detectors, LED, laser, Photo-diode, photo-resistor and their characteristics. Interferometers, applications in metrology. Basics of fiber optics. Biomedical instruments, EEG, ECG and EMG. Clinical measurements. Ultrasonic transducers and Ultrasonography. Principles of Computer Assisted Tomography.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. programme-2023

### Discipline: Electronics & Telecommunication Engineering

#### Section - I

**Electronic Devices and Circuits:** Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, BJT, JFET, MOS capacitor, MOSFET, Special diodes, Device technology: integrated circuits fabrication process, Oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twintub CMOS Process, Diodes and Transistor Circuits.

**Advanced Analog Circuits:** Differential and operational amplifier and its applications. Frequency response of amplifiers. Sinusoidal oscillators; criterion for oscillation; Passive & Active filters, Power supplies.

**Advanced Digital circuits:** Logic gates; digital IC families (DTL, TTL, ECL, MOS, and CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift- registers. Semiconductor memories. Microprocessors & Microcontroller (8085, 8086, 8051): architecture, programming, memory and I/O interfacing.

**Signals and Systems:** Definitions and properties of Laplace transform and discrete transform, DFT and FFT, z-transform. LTI Systems, convolution, poles and zeros, realization and analysis of Digital Filters. Architecture of DSP Processors, Digital image Processing techniques.

**Control Systems:** Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral- Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

**Communications Techniques:** Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems, SNR calculations for AM and FM for low noise conditions. Digital communication systems: PCM, DPCM, ASK, PSK, FSK, matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Optical Communication, Satellite Communication, Basics of TDMA, FDMA and CDMA and GSM. Information Theory & coding, Secure Communication, Mobile Communication Techniques.

**Microwave Communication Engineering:** Elements of vector calculus: divergence and curl; Maxwell's equations, wave equation, Waveguides : modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas and Wave propagation: Dipole antennas; radiation pattern; antenna gain.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Mechanical Engineering

#### Section - I

**Engineering Mechanics:** Free body and equilibrium; trusses and frames; virtual work; kinematic and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations; impact.

**Strength of Materials:** Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; strain energy methods; thermal stresses.

**Theory of Machines:** Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels; governors. Kinematic & dynamic analysis of planar mechanism, Lams, Gears & Gear train.

**Vibrations:** Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

**Design:** Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

**Thermodynamics:** Zero, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle, irreversibility and availability; behavior of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

**Fluid Mechanics:** Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy, fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

**Power Engineering:** Steam Tables, Rankine, Brayton cycles with regeneration and reheat, Cogeneration & Combined cycles.

**I.C. Engines:** Air-standard cycles, pre-ignition, detonation & diesel-knock, ignition system, cooling & lubrication system, emission & control, fuel injection & carburetion, supercharging, measurement of calorific values, engine performance & heat balance sheet.

**Heat Transfer:** Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

**Refrigeration and air-conditioning:** Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air; psychrometric chart, basic psychrometric processes.

**Turbo-machinery:** Pelton-wheel, flow of stream through nozzles & diffuses, Francis and Kaplan turbines-impulse and reaction principles, velocity diagrams, various types of gas turbines, reciprocating, centrifugal and axial flow compressors, multi-stage compression.

**Engineering Materials:** Structure and properties of Engineering materials, heat treatment, stress-strain diagrams for engineering materials. Common applications of various materials.

**Metal Casting:** Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations, types of casting processes.

**Forming:** Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy.

**Joining:** Physics of welding, brazing and soldering; adhesive bonding; design consideration in welding.

**Machining and Machine Tool Operations:** Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures.

**Unconventional Machining:** EDM, ECM, AJM, LBM, USM, EMB.

**Metrology and Inspection:** Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

**Computer Integrated Manufacturing:** Basic concepts of CAD/CAM and their integration tools, Robotic, Robotic Kinematics.

**Inventory Control:** Deterministic and probabilistic models; safety stock inventory control systems.

**Operation Research:** Linear programming, Graphical & Simplex method transportation, assignment, network flow models, simple queuing models, PERT and CPM, Game Theory.

**Value Engineering:** Value analysis for cost/value.

**Industrial Engineering :** Production Planning and Control; Forecasting- moving average, exponential smoothing, operations scheduling, assembly line balancing, product development, break even analysis, capacity planning.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Management

#### Section – I

##### **General Management**

Overview: Functions and Principles of management; Management Thought and Concepts; Management Decision Making Processes and Types.

##### **Managerial Economics**

Overview of Micro-Economics: Basic Concepts of Demand and Supply; Demand Analysis; Production Function; Cost-Output Relations; market Structures; Pricing theories; Overview of macro-Economics; National Income Concepts; Budgeting.

##### **Behavioral Science**

Overview of Organizational Behaviour; Understanding and managing Individual Behaviour-personality, Perception, Values, Attitudes, Learning and Motivation; Group Dynamics and Team Work. Overview of Organizational Development: Organizational structure; Organizational design; OD Interventions; Change Management.

##### **Human Resource management**

Overview of HRM: Concepts and Perspectives in HRM; HRM in Changing Environment, Overview of HR Planning: Objectives Process and Techniques; Job Analysis; Recruitment and Selection, Training and Development; Performance Appraisal; Exit Policy, Overview of Industrial Relations: Wage Policy and Determination; Trade Unions; Dispute Resolution and Grievance Management; Labour Welfare and Social Security Measures.

##### **Finance**

Overview of Financial Accounting; Analysis of Balance Sheet Statement, Overview of Cost Accounting: Costing Methods and Techniques, Overview of Financial Management: Fund Flow Analysis; Management of Working Capital, Overview of Capital Budgeting: Capital Budgeting Decisions; Capital Structure and Cost of Capital. Overview of Dividend Policy: Determinants; Long-term and Short-term Financing Instruments; Mergers and Acquisitions.

##### **Marketing Management**

Overview of Marketing: Marketing Mix, Market Segmentation, Targeting and Positioning; Overview of Product Management; Product Mix Decisions; Product Life Cycle, New Product Development, Branding; Pricing Methods and Strategies. Overview of Promotional

Management: Promotion Mix; Advertising; Personal selling; Channel Management; Evaluation and Control of Marketing Effort; Marketing of Services; Customer Relation management. Overview of E-Marketing: Uses of Internet as Marketing Medium; Issues in Branding, Market Development, advertising and Retailing on Internet.

### **Production Management**

Overview of Production management: Demand Forecasting for Operations; Production Scheduling; Work Measurement; time and Motion Study; Statistical Quality Control; Facility Location; Layout Planning. Overview of Operations Research: Linear programming; Transportation model; Inventory control; Queuing theory; Decision theory; PERT/CPM.

### **Quantitative Techniques**

Overview of Probability: Types of Probability distributions (e.g. Binomial, Poisson, Normal and Exponential). Overview of Sampling: Sampling distributions; Tests of Hypothesis; Large and small samples. Univariate and Bivariate Data Analysis: t-test, z-test, Chi-square tests; ANOVA.

### **Information System**

Overview of MIS: Application of Information Systems in management; MIS and Decision Making; System Analysis and Design. Overview of E-Commerce: e-commerce Business models; e-marketing; security issues in electronic commerce, legal issues in electronic commerce. Overview of ERP: Role of ERP in information integration; Evolution of ERP.

### **Strategic Management**

Overview of Strategic Management: Concept of Corporate Strategy; BCG Model; Porter's Generic Strategies; Competitor Analysis. Overview of Strategy Formulation and Implementation: Strategy Formulation and implementation at Corporate and Business level. Global Strategic Management: Transnationalization of World Economy; Managing Cultural Diversity; Global Entry Strategies; Managing International Business; Competitive Advantage of Nations.

### **Entrepreneurship**

Overview of Entrepreneurship: Theories of entrepreneurship; Innovation and Entrepreneurship. Small Business Concepts: Government policy for Promotion of Small and Medium Enterprises; Process of Business Opportunity Identification; Detailed Business Plan Preparation; Managing Small Enterprises; Planning for Growth; Sickness in Small Enterprises; Rehabilitation of Sick Enterprises; Entrepreneurship (Organizational Entrepreneurship).

### **Ethics in Business**

Overview of Ethical issues in Business: Value Based Organizations; Ethical Issues on Individual in Organizations; Gender Issues; Ecological Consciousness; Environmental Ethics; Social Responsibilities of Business; Corporate Governance and Ethics; Benefits of Corporate Social Responsibility.

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## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

### Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

#### Discipline: Applied Chemistry

#### Section - I

##### **Physical Chemistry**

Structure: Quantum theory : principles and techniques; applications to a particle in a box, harmonic oscillator, rigid rotor and hydrogen atom; valence bond and molecular orbital theories, Huckel approximation; approximate techniques: variation and perturbation; symmetry, point groups; rotational, vibrational, electronic, NMR, and ESR spectroscopy.

**Equilibrium** : Kinetic theory of gases; First law of thermodynamics, heat, energy, and work; second law of thermodynamics and entropy; third law and absolute entropy; free energy; partial molar quantities; ideal and non-ideal solutions; phase transformation: phase rule and phase diagrams –one, two, and three component systems; activity, activity coefficient, fugacity, and fugacity coefficient; chemical equilibrium, response of chemical equilibrium to temperature and pressure; colligative properties; Debye-Huckel theory; thermodynamics of electrochemical cells; standard electrode potentials; applications – corrosion and energy conversion; molecular partition function (translational, rotational, vibrational, and electronic).

**Kinetics** : Rates of chemical reactions, temperature dependence of chemical reactions; elementary, consecutive, and parallel reactions; steady state approximation; theories of reaction rates – collision and transition state theory, relaxation kinetics, kinetics of photochemical reactions and free radical polymerization, homogeneous catalysis, adsorption isotherms and heterogeneous catalysis.

##### **INORGANIC AND ANALYTICAL CHEMISTRY**

**Main group elements** : General characteristics, allotropes, structure and reactions of simple and industrially important compounds: boranes, carboranes, silicones, silicates boron nitride, borazines and phosphazenes. Hydrides, oxides and oxoacids of pnictogens (N, P), chalcogens (S, Se & Te) and halogens, xenon compounds, pseudo halogens and interhalogen compounds. Shapes of molecules and hard – soft acid base concept. Structure and Bonding (VBT) of B, Al, Si, N, P, S, Cl compounds. Allotropes of carbon: graphite, diamond, C<sub>60</sub>. Synthesis and reactivity of inorganic polymers of Si and P.

**Transition Elements** : General characteristics of d and f block elements; coordination chemistry: structure and isomerism, stability, theories of metal – ligand bonding (CFT and LFT), mechanisms of substitution and electron transfer reactions of coordination complexes. Electronic spectra and magnetic properties of transition metal complexes, lanthanides and actinides. Metal carbonyls, metal – metal bonds and metal atom clusters, metallocenes; transition metal complexes with bonds to hydrogen, alkyls, alkenes, and arenes; metal carbons; use of organometallic compounds as catalysts in organic synthesis. Bioinorganic chemistry of Na, K, Mg, Ca, Fe, Co, Zn, Cu and Mo.

**Solids**: Crystal systems and lattices, miller planes, crystal packing, crystal defects; Bragg's Law, ionic crystals, band theory, metals and semiconductors, Different structures of AX, AX<sub>2</sub>, ABX<sub>3</sub> compounds, spinels.

**Instrumental methods of analysis** : Atomic absorption and emission spectroscopy including ICP-AES, UV-visible spectrophotometry, NMR, mass, Mossbauer spectroscopy (Fe and Sn), ESR spectroscopy, chromatography including GC and HPLC and electro- analytical methods (Coulometry, cyclic voltammetry, polarography, amperometry, and ion selective electrodes).

## **ORGANIC CHEMISTRY**

**Stereochemistry**: Chirality of organic molecules with or without chiral centres. Specification of configuration in compounds having one or more stereogenic centres. Enantiotopic and diastereotopic atoms, groups and faces. Stereoselective and stereospecific synthesis. Conformational analysis of acyclic and cyclic compounds. Geometrical isomerism. Configurational and conformational effects on reactivity and selectivity/specificity.

**Reaction mechanism** : Methods of determining reaction mechanisms. Nucleophilic and electrophilic substitutions and additions to multiple bonds. Elimination reactions. Reactive intermediates- carbocations, carbanions, carbenes, nitrenes, arynes, free radicals. Molecular rearrangements involving electron deficient atoms.

**Organic synthesis** : Synthesis, reactions, mechanisms and selectivity involving the following alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids and their derivatives, halides, nitro compounds and amines. Use of compounds of Mg, Li, Cu, B and Si in organic synthesis. Concepts in multistep synthesis – retro synthetic analysis, disconnections, synthons, synthetic equivalents, reactivity umpolung, selectivity, protection and deprotection of functional groups. Pericyclic reactions: Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlation FMO and PMO treatments.

**Photochemistry** : Basic principles, Photochemistry of alkenes, carbonyl compounds, and arenes, Photo oxidation and photo reduction, Di-fi- methane rearrangement, Barton reaction. Heterocyclic compounds: Structure, preparation, properties and reactions of furan, pyrrole, thiophene, pyridine, indole and their derivatives.

**Biomolecules** : Structure, properties and reactions of mono and disaccharides, physicochemical properties of amino acids, chemical synthesis of peptides, structural features of proteins, nucleic acids, steroids, terpenoids, carotenoids, and alkaloids.

**Spectroscopy**: Principles and applications of UV-visible, IR, NMR and Mass spectrometry in the determination of structures of organic molecules.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Applied Mathematics

#### Section - I

**Linear Algebra:** Finite dimensional vector spaces; Linear transformations and their matrix representations, rank; systems of linear equations, eigen values and eigen vectors, minimal polynomial, Cayley-Hamilton Theorem, diagonalisation, Hermitian, Skew-Hermitian and unitary matrices; Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, self-adjoint operators.

**Complex Analysis :** Analytic functions, conformal mappings, bilinear transformations; complex integration; Cauchy's integral theorem and formula; Liouville's theorem, maximum modulus principle; Taylor and Laurent's series; residue theorem and applications for evaluating real integrals.

**Real Analysis :** Sequences and series of functions, uniform convergence, power series, Fourier series, functions of several variables, maxima, minima; Riemann integration, multiple integrals, line, surface and volume integrals, theorems of Green, Stokes and Gauss; metric spaces, completeness, Weierstrass approximation theorem, compactness; Lebesgue integral, Fatou's lemma, dominated convergence theorem.

**Ordinary Differential Equations :** First order ordinary differential equations, existence and uniqueness theorems, systems of linear first order ordinary differential equations, linear ordinary differential equations of higher order with constant coefficients; linear second order ordinary differential equations with variable coefficients; method of Laplace transforms for solving ordinary differential equations, series solutions; Legendre and Bessel functions and their orthogonality.

**Algebra:** Normal subgroups and homomorphism theorems, automorphisms; Group actions, Sylow's theorems and their applications; Euclidean domains, Principal ideal domains and unique factorization domains. Prime ideals and maximal ideals in commutative rings; Fields, finite fields. **Functional Analysis:** Banach spaces, Hahn-Banach extension theorem, open mapping and closed graph theorems, principle of uniform boundedness; Hilbert spaces, orthonormal bases, Riesz representation theorem, bounded linear operators.

**Numerical Analysis :** Numerical solution of algebraic and transcendental equations; bisection, secant method, Newton-Raphson method, fixed point iteration; interpolation; error of polynomial interpolation, Lagrange, Newton interpolations; numerical differentiation;

numerical integration; Trapezoidal and Simpson rules, Gauss Legendra quadrature, method of undetermined parameters; least square polynomial approximation; numerical solution of systems of linear equations; direct methods (Gauss elimination, LU decomposition); iterative methods (Jacobi and Gauss-Seidel); matrix eigenvalue problems; power method, numerical solution of ordinary differential equations; initial value problems; Taylor series methods, Euler's methods, Runge-Kutta methods.

**Partial Differential Equations:** Linear and quasilinear first order partial differential equations, method of characteristics; second order linear equations in tow variables and their classification; Cauchy, Dirichlet and Neumann problems; solutions of Laplace, wave and diffusion equations in two variables; Fourier series and Fourier transform and Laplace transform methods of solutions for the above equations. Mechanics: Virtual work, Lagrange's equations for holonomic systems, Hamiltonian equations.

**Topology :** Basic concepts of topology, product topology, connectedness, compactness, countability and separation axioms, Urysohn's Lemma.

**Probability and Statistics :** Probability space, conditional probability, Bayes theorem, independence, Random variables, joint and conditional distributions, standard probability distributions and their properties, expectation, conditional expectation, moments; weak and strong law of large numbers, central limit theorem; Sampling distributions; Testing of hypothesis, standard parametric tests based on normal, Chi-Square, t, F – distributions; Linear regression; Interval estimation.

**Linear programming:** Linear programming problem and its formulation, convex sets and their properties, graphical method, basic feasible solution, simplex method, big-M and two phase methods; infeasible and unbounded LPP's, alternate optima; Dual problem and duality theorems, dual simplex method and its application in post optimality analysis; Balanced and unbalanced transportation problems, u- v method for solving transportation problems; Hungarian method for solving assignment problems.

**Calculus of Variation and Integral Equations:** Variation problems with fixed boundaries; sufficient conditions for extremum, linear integral equations of Fredholm and Volterra type, their iterative solutions.

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## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

### Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

#### Discipline: Applied Physics

#### Section - I

**Mathematical Physics:** Dimensional analysis; Vector algebra and vector calculus; Linear algebra, matrices; linear differential equations; Finite difference methods; Elementary probability theory, binomial, Poisson and normal distributions. Fourier series, Fourier and Laplace transforms; Elements of complex analysis.

**Classical Mechanics:** Newton's laws; central forces, Kepler problem and planetary motion; collisions and scattering in laboratory and centre of mass frames; mechanics of system of particles; rigid body dynamics; moment of inertia tensor; non inertial frames and pseudo forces; variational principle; Lagrange's and Hamilton's formalisms; equation of motion, cyclic coordinates, Poisson bracket; periodic motion, small oscillations, normal modes; special theory of relativity – Lorentz transformations, time dilation, length contraction, relativistic kinematics, variation of mass with velocity, mass- energy equivalence, relation between energy and momentum.

**Electromagnetic Theory :** Electrostatics : Gauss' Law and its applications; Laplace and Poisson equations, boundary value problems; Magneto statics: Biot-Savart law, Ampere's theorem,; dielectrics and conductors; dielectric polarization; Concept of internal field; electromagnetic induction Faraday's law; Maxwell's equations; scalar and vector potentials; Electromagnetic waves and their reflection, refraction, interference, diffraction and polarization. Poynting vector, energy and momentum of electromagnetic waves; radiation from a moving charge.

**Quantum Mechanics:** Physical basis of quantum mechanics; Wave – particle duality; De-Broglie hypothesis; electron and neutron diffraction experiment, wave packet and group velocity, wave function and probability interpretation, quantization of atomic energy, Heisenberg's uncertainty principle; Schrodinger equation (time-dependent and time-independent); Eigen value problems such as particle-in-a-box, harmonic oscillator, etc; Tunneling through a barrier; Orbital angular momentum.

**Thermodynamics and Statistical Physics :** Laws of thermodynamics and their consequences; macro states and microstates; phase space; probability ensembles; partition function, free energy, calculation of thermodynamic quantities; classical and quantum statistics; degenerate Fermi gas; black body radiation and Planck's distribution law; Bose-Einstein

condensation; first and second order phase transitions. Atomic and Molecular Physics : Quantum states of an electron in an atom; Electron spin; Spectra of one-and many-electron atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibration, electronic, and Raman spectra of diatomic molecules; Spontaneous and stimulated emission, Einstein A & B coefficients; Lasers, optical pumping, population inversion, rate equation; Modes of resonators and coherence length. Temporal and spatial coherence.

**Solid State Physics:** Atomic structure and bonding in materials. Crystal structure of Materials, unit cells and space lattices, determination of structures of simple crystals by x-ray diffraction, miller indices of planes and directions, Concept of amorphous, single and polycrystalline structures and their effect on properties of materials. Crystal growth techniques. Imperfections in crystalline solids and their role in influencing various properties; free electron theory; band theory of solids; metals, semiconductors and insulators; types of semiconductors & conduction mechanism, Hall effect; Diamagnetism, Para magnetism, and ferromagnetism; Electron motion in a periodic potential, Superconductivity, type-I and type-II superconductors, Joseph son junctions.

**Nuclear and Particle Physics :** Basic nuclear properties; size, shape, charge distribution, spin and parity; mass defect, Binding energy, semi-empirical mass formula; Liquid drop model; Nature of the nuclear force, nuclear shell model; Alpha decay, Beta-decay, gamma decay, Laws of radioactivity, Rutherford scattering, nuclear reactions, reaction mechanisms, compound nuclei and direct reactions; conservation laws; controlled and uncontrolled chain reaction critical mass, multiplication factor, fission and fusion; nuclear reactor, particle accelerators and detectors; mass spectrographs, elementary particles.

**Electronics:** Semiconductor device physics: including diodes, junctions, depletion region, barrier potential, Fermi level, biasing, transistors, Bipolar Junction Transistors, field effect Transistors, amplifier and oscillator circuits; operational amplifier, negative feedback circuits, rectifier circuits, regulated power supplies; logic gates & symbols, Boolean algebra, De-Morgan's Theorem, basic digital logic circuits, Optoelectronic devices, including solar cells, photo detectors, and LEDs; Digital techniques and Applications (registers, counters, comparators and similar circuits); A/D and D/A converters.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Pharmacy

#### Section – I

**Pharmacognosy & Phytochemistry :** Chemistry test, isolation and characterization of phytopharmaceuticals belonging to the group of Alkaloids, Glycosides, Terpenoids, Steroids, Purines, Guggual lipids, Pharmacognosy of crude drugs that contain the above constituents. Standardization of raw materials and herbal products. Biotechnological principles and techniques for plants development. Tissue culture.

**Pharmacology & Toxicology:** General pharmacological principle including Toxicology. Drug interaction, Pharmacology of drugs acting on Central nervous system, Cardiovascular system, Autonomic nervous system, Gastro intestinal system and Respiratory system. Pharmacology of Autocoids, Hormones, Hormone antagonists, Chemotherapeutic agents including anticancer drugs. Bioassays, Immuno Pharmacology. Drugs acting on the blood & blood forming organs. Drugs acting on the renal system.

**Medicinal Chemistry :** Introduction to drug design, Structure, Classification, Synthesis, SAR and uses of the following category of drugs – Hypnotics and Sedatives, NSAIDS, Neuroleptics, Antidepressants, Anxiolytics, Anticonvulsants. Local Anesthetics, Cardio Vascular drugs – Antianginal agents, Vasodilators, adrenergic & Cholinergic drugs, Diuretics, Antihypertensive drugs, Hypoglycemic agents, Antilipemic agents. Chemotherapeutic agents, Antibiotics, Sulphadugs, Antitubercular, Preparation, storage and uses of official Radiopharmaceuticals.

**Pharmaceutics & Pharmaceutical Jurisprudence:** Development, manufacturing standards, Q.C. limits, labeling of Tablets, Capsules and Parenterals as per the pharmacopoeal requirements. Storage of different dosage forms and new drug delivery systems (Nanoparticle, Ocular drug delivery system and Transdermal drug delivery systems). Bio-pharmaceutics and Pharmacokinetics and their importance in formulation. Formulation and preparation of cosmetics –lipstick, shampoo, creams, nail preparations and dentifrices. Pharmaceutical calculations. Drugs and cosmetic Act and rules with respect to manufacture, sales and storage, Pharmacy Act.

**Pharmaceutical Chemistry (Analysis):** Principles, instrumentation and applications of the following: Absorption spectroscopy (UV & IR). Fluorimetry, Flame photometry, Potentiometry, Conductometry and Polarography, Principles of NMR, Mass Spectroscopy, X-ray diffraction analysis and different chromatographic methods (TLC, HPLC, HPTLC and GC).

**Biochemistry:** Metabolism of Carbohydrate, lipids and proteins, Biochemical role of Vitamins, Enzymes, Nucleic acids. General principles of immunology. Methods of determine kidney & liver function.

**Microbiology:** Principles and methods of microbiological assays of the Pharmacopoeia. Methods of preparation of official sera and vaccines, Serological and diagnostics tests. Application of microorganisms in Pharmaceutical industry.

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## **CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI**

### **Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023**

#### **Discipline: Humanities**

#### **Section – I & II**

##### **I. Phonetics and Phonology of English & Modern English Grammar**

General Phonetics and Phonology, Production of speech, Structural Phonology, Grammar & Various kinds of Grammar; Notions of Grammaticality and Acceptability; Traditional, Structural and Generative Models, Morphology & Morphophonemics and Syntax.

##### **II. Applied Linguistics**

Scope and Definition of Applied Linguistics, Traditional Approach to Linguistics Structural Approach to Linguistics and Cognitive Approach to Linguistics

##### **III. Literature**

**Literary forms :** Prose, poetry and drama.

**British Literature:** Chaucer, Shakespeare, Milton, Alexander Pope, John Keats, Byron, P B Shelly, William Wordsworth, Robert Browning, Arnold, John Dryden, S T Coleridge, G B Shaw, D H Lawrence, E M Foster, W B Yeats, George Orwell.

**American Literature:** T S Eliot, W H Auden, Eugene O'Neill, Emerson, Thoreau, Hawthorne, Thomas Hardy, Ernest Hemingway, Walt Whitman, Emily Dickenson, Robert Frost, Silvia Plath, Tennyson, Mark Twain, Ezra pound, Allen Tate, Virginia Woolf, Tennessee Williams.

**Indo-Anglean Literature :** Henry Derozio, Toru Dutt, Sarojini Naidu, Rabindranath Tagore, Aurobindo Ghosh, Girish Karnad, Raja Rao, Mulk Raj Anand, R K Narayan, Kamala Markandaya, Nissim Ezekiel, Kamala Das, Khushwant Singh, Salman Rushdie, Vikram Seth, V S Naipaul, Arundhati Roy, Anita Desai.

**Critical Theories:** Aristotle, Longinus, Eliot, William Wordsworth, Coleridge, Mathew Arnold, Eliene Showalter, Psycho-Analytic Criticism and Feminist Criticism.

##### **IV. Research Methodology:**

Basic Concepts of Research, Research methods, Strategies and Study Skills

##### **V. Professional Communication:**

Basic Concepts, Report Writing Presentation Skills, Interpersonal Skills, Organizational Behaviour and Communication.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Environmental Engineering

#### Section – I

**Eco-Hydrology:** Aim, scope and applications of ecology - Development and evolution of ecosystems – Principles and concepts pertaining to communities in ecosystem - Energy flow and material cycling in ecosystems – productivity in ecosystems - Rationale of ecological engineering and eco-technology - Classification of Eco-technology, Hydrologic processes, Precipitation, Infiltration & runoff, Evaporation, Evapotranspiration, Stream flow, Hydrologic measurements and networks, Hydrograph, Unit hydrograph, Aquifer and aquifer properties, Darcy's law, Permeability, Properties of fluids, Kinematics of fluid flow, Dynamics of fluid flow, Flow in pipes, Turbulent flow in pipe, Continuity, Momentum and energy equations and their applications; Potential flow, Laminar and turbulent flow, Pipe networks, Compressibility effect in pipe flow.

**Water & Waste Water Engineering:** Water demand, Classification of water demands- estimation and design, Quality of Water, physical, chemical and biological characteristics of water, Water flow systems, Water quality standards, Theory of sedimentation, Sedimentation tank-types; design, Theory of filtration-types; process, Softening- types; process, Sewage and Sewerage- estimation; treatment, System of sanitation: Conservancy systems, Primary and secondary treatment systems, Sewage sludge treatment and sewage disposal, Solid waste management.

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## CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

### Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

#### Discipline: Water Resource Engineering

#### Section – I

**Hydrology:** Hydrologic processes, Precipitation, Infiltration & runoff, Evaporation, Evapotranspiration, Stream flow, Hydrologic measurements and networks, Hydrograph, Unit hydrograph, Aquifer and aquifer properties, Darcy's law, Permeability.

**Fluid Mechanics:** Properties of fluids, Kinematics of fluid flow, Dynamics of fluid flow, Flow in pipes, Turbulent flow in pipe, Continuity, Momentum and energy equations and their applications; Potential flow, Laminar and turbulent flow, Pipe networks, Compressibility effect in pipe flow.

**Water & waste water Engineering:** Water demand, Classification of water demands- estimation and design, Quality of Water, physical, chemical and biological characteristics of water, Water flow systems; Water quality standards, Theory of sedimentation, Sedimentation tank-types; design, Theory of filtration- types; process, Softening- types; process, Sewage and Sewerage- estimation; treatment, System of sanitation: Conservancy systems, Primary and secondary treatment systems, Sewage sludge treatment and sewage disposal, Solid waste management.

**Irrigation Engineering:** Methods of irrigation and water requirements of crops, canal irrigation, Water logging and its control, River behaviour, Control and training, Reservoir planning, Dams- types; suitability; failure; design, Spillways and energy dissipaters, Diversion headworks, Regulation Work, Cross drainage work.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

## Syllabus for Entrance Examination for Admission in Ph.D. Programme-2023

### Discipline: Architecture

#### Section – I

**New trends and techniques in application of structural principles:** Effect of various foundation settlements on the behaviour of super structure, concept of structure forms and their stability to various types of structures, RCC space frames and steel space structures and hyperboloid. : Mechanical, Electrical, Firefighting and security, vertical transportation, HVAC, BAS and Parking; Codes for the services. Construction planning and management, equipment's, materials and construction techniques, prefabrication. Project management; Strategies and advancement; BIM.

**Building Technologies-** Structure, material, design communication, management, maintenance. Energy consumption in luminaries, HVAC, plumbing, transportation, miscellaneous systems; Comparison of different technologies and systems for efficiency and performance. Energy audit of buildings- tools and techniques; Measurement and verification techniques; Benchmarking. Energy cycle in built environment; Importance of energy; Sources of energy- grid and off grid (thermal, hydro, solar, gas, biomass) and uses of energy in buildings and settlements- lighting, ventilation, air conditioning, cooking, miscellaneous etc. CPM and PERT; BIM; 4D and 5D; Lean construction; Time management and scheduling; Construction waste management; Recycling and reuse. Design methodologies for architectural design, interior design and urban design; Industrial design methodology. Visions of city form; Patterns of human settlement through history; Contemporary theories of urbanity & urban design; Spatial & social structure; Elements of urban form. Evolution of city form and process; Land; Landscape and townscape; Contemporary urban form issues. Vernacular Architecture: Definition and characteristics; Vernacular architecture and traditional architecture. Factors Influencing Vernacular Architecture: Evolution of development of shelter form and identity; Physiography, ecology, culture and vernacular architecture; Difference in rural and urban vernacular architecture. Climatology: Climatology as a component of manmade ecosystem, macro-, meso and microclimate; Ecosystem-atmosphere interactions; Urban heat island; Urban wind pattern, aerosols and air pollution, Simulation tools.

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# **CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI**

**Ph.D. Entrance Examination Scheme, 2023**

**Maximum Marks – 100**

**Duration of Examination – 3 hrs**

## **Section – I**

Consisting of 40 objective type questions from relevant discipline of the syllabus.

## **Section – II**

Consisting of 60 objective type questions from any of the specialization of the relevant discipline of the syllabus.

The weightage for section I shall be 40% & section II shall be 60%.



**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Civil Engg.**

**Section - II**

**Specialization**

**A: Structural Engineering**

**Advanced Reinforced Concrete Structures**

Concrete Technology: Concrete as structural material, strength of concrete and its significance, Strength porosity relationship, Factors effecting compressive strength, Behavior of concrete under stress states, Durability of concrete and its significance, Sulphate attack, Alkali aggregate reaction, Corrosion of embedded steel in concrete and concrete deterioration due to corrosion of steel and its preventive measures.

Design of Slender Columns: Concentrically loaded slender columns, eccentrically loaded slender columns, Slender columns subjected to axial and transverse loads, Structural behaviour of columns in braced and unbraced frames, Codal procedure for design of slender columns.

Flat Slabs: Elements of flat slabs, Codal procedure for design of flat slabs, Behaviour of flat slab in shear, One way and two way shear, Opening in flat slabs, Effect of pattern loading in flat slabs.

Design of Beam Column Joints: Types of joints, Joints in maltistoreyed buildings, Forces acting on joints, Design of joints.

**Dynamic of Structures**

Single Degree of Freedom Systems: Fundamental, Mass spring damper system, Analysis of free vibrations, Response to harmonic loading, periodic loading, Impulsive loading and general dynamic loading. Generalised SDOF, Vibration analysis by Rayleigh method.

Multi Degree of Freedom Systems: Two degree of freedom system – undamped, free & forced. Multidegree of freedom system- undamped, Holter method, Stodola method, Orthogonality condition, Damped system. Dynamic analysis and Response- Modal Analysis, Response spectrum analysis, Rayleigh's-Ritz method.

Structures with Distributed Mass and Load: Axial, shear and transverse vibration due to bending of beams, Uniform shear beam, Beam in bending, Numerical techniques for shear beam, Bending of beams, Forced vibration, Plates or slabs subjected to normal loads.

Earthquake Motion and Response: Introduction, Strong motion earthquake, Numerical method for spectra, Elastic spectra, Ground velocity and displacement, Inelastic spectra, Equivalent linear system, Comparison of an elastic and inelastic system.

A seismic Design of Structures: Design data and philosophy of design, Seismic co-efficient, permissible increase in stress and load factor for multistoreyed buildings, Base shear, Fundamental time period of buildings, Distribution of forces along the height, Dynamic analysis using IS: 13912, Earthquake resistant construction of buildings, Ductility provision in reinforced concrete construction of structures, Design of water towers, Stack like structures.

### **Advanced Steel Structures**

Concept of Plastic Design: Introduction, Theory of plastic bending, Assumptions, Bending of rectangular section, Plastic hinge, Redistribution of moments, Computation of plastic moment, Shape factor, Overload factor, Method of plastic analysis : Statical Method, Mechanism method, Upper bound, Lower bound and uniqueness theorem, Partial, Complete and over complete failure of indeterminate structures.

Plastic Analysis of Frames: Plastic analysis of portal frames subjected to transverse and lateral loads, Analysis of gable frames, Analysis of multibay multistoreyed frames, Moment balancing method.

Deflections: Assumption, Calculation of deflection at ultimate loads, Deflection at working loads, Rotation capacity.

Secondary Design Consideration: General, Influence of axial force on the plastic moment, Influence of shear force, Local buckling of flanges and webs, Lateral buckling.

### **Advanced Structural Analysis**

Stiffness Method: Basis of stiffness method, Influence coefficients, Kinematic indeterminacy, Degree of freedom, Action displacement relationship, Direct stiffness approach, Transformation of axes system, Representing the imposed loads as nodal loads, Elastic supports, Support displacements, Application to various type of structures e.g. Continuous beams, Trusses, Frames and grids, Temperature effects.

Flexibility Method: Particular solution, Complimentary solution, Compatibility equations, Flexibility coefficients, Application of complimentary energy principles, Basis of the method, Numerical integration for flexibility coefficients, Application to various type of structures, Elastic supports, Supports displacement, Temperature shrinkage, Imperfect fit, Analysis of pin jointed trusses, Rigid frames.

Finite Element Method: Introduction, Basic steps in finite element method, Coordinate systems, Rotation of axes, Shape functions, Elements stiffness matrix and load vector, Triangular element in plane stress and strain, Numerical integration, Isoperametric elements,

Rectangular elements in plate flexure, Triangular element in plate flexure, Rectangular element in plane stress and bending combined, Computer programs for these elements.

## **B: Highway Engineering**

### **Geometric Design**

Geometric design standards of Highways: Controls and Criteria for geometric design, basic requirements, Design vehicle, Design of capacity, level of service, design of camber, design methods used in field, design of cross-section elements, design and analysis of different sight distances IRC specifications for design.

Design of Horizontal Alignment: Design and analysis of super elevation, methods for eliminating camber and buildings super elevation in the field, design of extra widening, methods for providing extra widening in the field, design of transition, design of combined curve, IRC specifications for design.

Design of Vertical Alignment: Design of gradients, basic criteria and methods for designing summit and & valley vertical curves, IRC specification for design.

Geometric Design of Inter-sections: Design elements of intersections, elaborate design of rotary intersection, grade separated intersections, median separators.

### **Pavement Analysis & Design**

Importance and functions of various components of pavement structures, concept of wheel loads and tandem axles, ESWL, vehicle damage factors.

Design of Flexible pavements: CBR method of flexible pavement design. Old concepts to be recent concept by IRC-37-2001, Design by group index method, Design of low cost roads.

Design of rigid pavement: Factors affecting, Analysis of stresses, equivalent wheel load, Westergaard's analysis, IRC design guidelines, design of joints, tie bars, dowel bars, CRCP, FRC and pre-stressed concrete pavements.

### **Highway Materials Design & Construction**

Bituminous materials and mixes: Terminology, classification, distillation, grades, asphalts and tars, testing methods and specifications, bitumen aggregate interactive mechanism, design of bituminous mixes.

Intermediate and high type bituminous pavements: Concept of macadam roads, Bituminous surface treatments, Road mix and bituminous plant mixes, bituminous bound macadam, asphalt and concrete, Bituminous concrete laying procedures, use of admixtures, construction methods and machinery.

Rigid pavements: Base course function, design of pavement grade mixes, Construction equipment, methods, quality control and procedures, pumping, joint filers and sealants, mix selection, compaction methods and construction procedures for reinforced and pre-stressed

pavements.

### **Advanced Traffic Engineering**

Introduction: Traffic characteristics, PIEV theory, Traffic flow Characteristics, capacity and level of service concept

Traffic studies: Traffic Volume, spot speed, speed & delay, axle load surveys, Origin & Destination study, sampling techniques, presentation of traffic data, analysis and applications

Traffic facilities design: Design of parking facilities, Design of lighting and terminal facilities.

Traffic Operations and Control: Traffic regulation, Traffic control devices i.e. signs and markings, design of traffic signals.

Traffic Safety: Effect of road conditions on traffic safety, Accident study, presentation and analysis of traffic data, improvement measures

Intelligent Transport System: Highway communication, automatic vehicle detection, electronic toll collection system, advanced driver information system, simulation of traffic systems.

## **C: Environmental Engineering**

### **Environmental Chemistry**

Basic concepts of chemistry involved in water & wastewater analysis: Basic concepts of General chemistry, Physical chemistry, Equilibrium chemistry, Organic chemistry, Bio chemistry, Colloidal chemistry, Nuclear chemistry. Basic concepts of quantitative chemistry: Sampling Gravimetric analysis, Volumetric analysis, Colourimetry, Spectrophotometry. Industrial Methods of Analysis, Optical Methods; Electric Methods Chromatographic methods.

Chemistry of Turbidity, colour, pH, Acidity, Alkalinity Hardness, Residual chlorine, Chlorides, Dissolved oxygen, BOD, COD, Nitrogen, Oil and Grease.

### **Advanced Wastewater Treatment**

Quality characteristics of wastewaters. Physical, chemical & Biological water quality parameters. Water quality requirement; Stream Standards, Potable water standards and wastewater Influent standards, Physico- chemical processes involved in Waste water treatment;

Sedimentation, Coagulation & Flocculation, various types of setting, settling tank; principle and design, Grit chamber; principle, types and design aspects. Filtration: Theory, methods of filtration and their modified forms.

Disinfections: Objective and different methods. Organic impurities of waste water,

composition of wastewater, biological treatment, aerobic and anaerobic processes. Microorganisms in biological treatment and their metabolic kinetics. Kinetics of plug flow and complete mix reactors.

ASP and its modifications, aeration, objectives and methods, design of aeration devices.

Bio-filters: various types, Trickling filters and their design. Sludge handling and disposal; Sludge types and composition. Various methods of sludge treatment. Sludge digestion tanks. Disposal of sludge. Tertiary treatment of wastewater: objectives and methods.

### **Air Pollution & Control**

Introduction, Atmospheric composition, Origin of air pollution, Global implications of air pollution, Classification of air pollutants, Particulates, Hydrocarbons and Gaseous air pollutants. Sources of air pollutants and their health effects. Meteorological aspects of air pollution, Influence of Meteorological aspects on Air Quality: Lapse rate and Dispersions, Wind and Dispersions, Moisture and dispersion, modeling.

Air Pollution sampling: Ambient and stack sampling, Ambient Air Quality Monitoring, Engineered systems of air pollution Control: Atmospheric cleansing process, approaches to contaminant control. Control devices for particulate contaminant and gaseous contaminants.

### **Environmental Pollution & Management**

Water Pollution: Components of water, hydrological cycle and water budget equation, Effects of Environmental Pollution on components of hydrological cycle.

Classification of water pollutants and their sources, Types of water pollution, Sources of water pollution and effect of polluted waters on environment and health. Consequences of polluted water disposal on land, rivers and lakes.

Self purification of river and impoundments. Do sag curve and self purification models. Eutrophication of lakes; Ground water pollution, Causes and consequences, Artificial recharging of ground waters.

Noise Pollution: Noise & Noise pollution definitions Physical parameters of Noise pollution, Sources and health effects of Noise pollution. Strategies for noise pollution control; Control at sources and control at path. Case studies of Noise Pollution and its control.

## **D: Geotechnical Engineering**

Origin and Classification of soils, and Phase Relationships, Clay mineralogy, Diffuse double layer, Compaction Effective Stress Principle, Permeability, Seepage pressure, Quick sand condition, Pore pressure lines, Flow nets, Compressibility, Terzaghi's Consolidation Theory, Shear Strength, Shear Strength Parameters – total stress and effective stress, Mohr's Circle, Failure

Envelope, Stress path

Site Exploration: Methods of soil exploration with relative merits and demerits, Depth and spacing of bore holes, Standard penetration tests, Plate load tests, Static cone penetration tests etc.

Bearing Capacity: Bearing capacity theories, corrections for size, shape, depth, eccentricity of loading, water table etc., Presumptive bearing capacities, Codal provisions

Lateral earth Pressure: Rankine's and Coloumb's theories, Earth pressure computation in different soils and surcharge load, Rebhnann's and Culmann's construction. Design considerations of earth retaining structures.

Foundations: Shallow Foundations, Pile Foundations (including under-reamed piles), Cassion and Well foundations; Design considerations, Codal provisions, Layered soils. Choice of shear strength parameters, Total and differential settlement. Stress distribution, Consolidation settlement in clays (with correction factors), Immediate settlement, Settlement in sands

Slope Stability: Finite and infinite slopes, Critical failure surface, factor of safety, Causes of failure in earthen dams and remedial measures.

Ground Improvement: Mechanical soil stabilization, Mixing additives, Compaction piles, compaction by dynamic loads, Pre-loading using sand drain, Reinforced soil

Soil Dynamics: Engineering problems involving soil dynamics; Dynamic loading, Role of inertia; Theory of Vibrations, Types of machine foundations, Design criteria for machine foundations, Codal provisions.

## **E: Water Resources / Irrigation Engineering**

**Advanced Hydrology:** Introduction Precipitation, Water Losses, Runoff, Estimation of average monthly and annual runoff, rainfall - runoff relationships. Analysis of data , Supplementing missing data, consistency of record, hyetograph, mass curve analysis, depth areas duration analysis. Rainfall frequency analysis, estimation of evaporation and evapotranspiration, Synthetic unit hydrograph, S- curve, Unit hydrograph of varied durations, Instantaneous unit hydrograph, conceptual models, Design Flood, Flood Forecasting Hydrologic Models.

**Fluid Mechanics:** Equations of motion in general orthogoral coordinate system, Kinematics of Flow, Hydrodynamics, Boundary Layer Theory, Laminar boundary layer, turbulent boundary layer; stability analysis of the boundary layer, Laminar Flow, Turbulent Flow, Dimensional analysis, similitude and model testing.

**Open Channel Flow:** Fluid Flow Concepts, Classification of channels basic equation; Uniform flow in rigid boundary channels, Shear stress and its distribution, conveyance of a channel, relation with depth; Gradually varied flow-types and governing equation, non-Prismatic channels; Hydraulic Jumps, Forced hydraulic Jump, Jump in rectangular and nonrectangular channels; Channel Controls, Transitions, Unsteady flow, Waves, Celerity of a wave, Surge, Method of characteristics, Flood Routing,

**Water Resources & Planning:** Project Planning, Resources Planning, System Engg. Earth and Concrete dam, Types of dams:- Rigid dams, Gravity dams, Arch and buttress dams, Basic principles of design and details of construction, Project Economic. Operation of reservoirs. Water management Policy during droughts

**Irrigation & Drainage design:** Soil & Soil Fertility, Water Requirement of crops, Irrigation methods, Management of Irrigation systems, Irrigation works, Water Logging, Drainage, Design of Drainage system. Salinity of soil. Salinity control. Quality of irrigation water

**Ground Water Engineering:** Ground water in Hydrologic cycle, Ground Water-Inventory, Flow into Well, Construction of Wells, Shallow Well, Replenishment of Ground Water, Investigation of Ground Water, Ground Water Management, Techniques of artificial recharge, Sea water intrusion into coastal aquifers, multiple well systems ground water development and management.

**Water Power Engineering:** Development of water power, Estimation of Hydropower potential, Comparison of Hydro, thermal and nuclear power, Flow duration curve, firm power, secondary power, Load and Load duration curves, Load factor, Classification of hydropower plants, Penstocks:- Alignment, types of penstocks, economic diameter of penstocks.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Computer Science and Engineering**

**Section-II**

**Specialization to CSE**

**A) Artificial Intelligence and Soft-computing:** Natural Language Processing, AI v/s ANN, Neural Networks, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb's learning rule, Delta rule, Associative Memory, Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, crisp logic, fuzzy logic, introduction & features of membership functions, fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic, GA encoding, fitness function, reproduction, Particle Swarm Optimization, Ant Colony Optimization.

**B) Data Mining and Big Data:** Basic Data Mining Tasks, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective, Clustering, Classification and prediction models, Pattern mining and association rules, Apriori principle, Mining high-frequency patterns and high-confidence rules, Interestingness measures for patterns and rules, Big data and social sensing, Big data acquisition, Web scraping, crawling, crowdsourcing, crowd-sensing, Big data technologies and platforms, basic concept of cloud computing, virtualization.

**C) Digital Image Processing and Computer Vision:** Image Processing and Computer Vision Background, Image Processing and Computer Vision Applications, Human Perception of Pictures, Digital Image Processing Hardware, Image Model, Amplitude digitization, Intensity Quantization, Spatial co-ordinate digitization, Image Sampling, Image Quality, Image Pixel Relationships, Linear Operators, 2-D Transforms, Spatial Domain Methods, Frequency Domain Methods, Inverse Filtering, Image Compression, Redundancy Types, Lossless and Lossy Compression, Image Compression Standards, Object Detection Methods, Edge Liking and Boundary Detection, Thresholding Methods, Region Oriented Methods. Object Representation and Description, Representation schemes, Description, Pattern Recognition, Decision Theoretic Methods for Recognition.

**D) Advanced Computer Network and Security:** Routing algorithms, Congestion control algorithms, Internetworking, Services and elements of Transport protocols, MANET, Introduction to Network Security, Symmetric Encryption and Message Confidentiality, Public key Cryptography and Message Authentication, Authentication Application, Electronic Mail Security, IP Security, Web Security, Network Management Security, Intruders, Malicious Software Firewalls.

**E) Simulation and Modeling:** Mathematical Model, types of Mathematical models and properties, Procedure of modeling, Graphical method: Bartering model, Basic optimization, Monte-Carlo simulation, Approaches to differential equation: Heun method, Local stability theory: Bernoulli Trials, Classical and continuous models, Case studies in problems of engineering and biological sciences. General techniques for simulating continuous random variables, simulation from Normal and Gamma distributions, simulation from discrete probability distributions, simulating a non – homogeneous Poisson Process and queuing system.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Information Technology**

**Section - II**

**Specialization to IT**

**A) Information Security and Coding:** Security Models and Policies, Program Security, Malicious Software, Operating system security, Privacy and Privacy Enhancement Tools, Steganography, Social Engineering, Security threats on Social networks, digital signature schemes, Interactive Proofs, two-party secure computation, multiparty secure computation, and chosen-ciphertext security, Quantum Cryptography, entropy, relative entropy, mutual information, chain rules, data processing inequality, the asymptotic equipartition property, entropy rates for stochastic processes, arithmetic coding, discrete channels, random coding bound and converse, Gaussian channels, linear block codes and their properties, hard-decision decoding, cyclic codes, Homomorphic encryption

**B) Mobile and Pervasive Computing:** Cellular Wireless Networks, GSM, Architecture, Protocols, Connection Establishment Frequency Allocation, Routing, Mobility Management, Security, GPRS, Wireless LANs and PANs IEEE 802.11 Standard Architecture Services Network HyperLAN Blue Tooth WiFi WiMAX, Pervasive computing infrastructure applications Device Technology Hardware, Human-machine Interfaces, Biometrics, and Operating systems Device Connectivity Protocols, Security, and Device Management Pervasive Web Application architecture Access from PCs and PDAs Access via WAP.

**C) Data Science for Internet of Things:** Hardware, SoC, sensors, device drivers, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy, beacons, Introduction to Data Science, Goals of statistical graphics and data visualization, Graphs of Data, Graphs of Fitted

Models, Graphs to Check Fitted Models, Principles of graphics, Bayesian inference: combining models and data in a forecasting problem, Bayesian hierarchical modeling for studying public opinion, Bayesian modeling for Big Data, IoT datasets and APIs by application: Healthcare, Manufacturing, wearables, Energy.

**D) Pattern Recognition, Image Processing and Data Mining:** Pattern Recognition: Basic Concept of Pattern Recognition, Fundamental Problems in Pattern Recognition Systems, Design Concepts and Methodologies, Linear Decision Functions, Pattern Classification by Distance Functions, Pattern Classification by Likelihood Functions, Trainable Pattern Classifiers - The Deterministic Approach. Image Processing: Digital Image Fundamentals, Image enhancement in the Spatial and Frequency, Domain, Image Segmentation, Morphological Image Processing. Data Mining and Soft Computing: Introduction to Data Mining and soft computing, what is soft computing? Role of Fuzzy sets, neural networks, Rough Sets, Genetic Algorithm, Wavelets and their Hybridization in Data Mining, Classification and clustering in Data Mining, Multimedia Data Mining.

**E) Semantic Web and Linked data:** Introduction: History of Web, World Wide Web, Internet, Working Mechanism of Web, Importance of Document on the Web, URL, IRI, Namespace, Domain. Semantic Web: What is Semantic? What is Semantic Web? Semantic Web Road Map, Comparison between Semantic Web and Traditional Web, Semantic Web Layer Cake and Their Significance, Vision of Semantic Web, Short Introduction to Ontology. Preliminary Knowledge on XML, RDF, RDFa, Microdata. RDF (Resource Description Framework) & RDF Schema: Introduction to RDF, Different Features and Components of RDF, Detail Study of RDF Class, Property, Instances, Restriction, Domain and Range of Properties and their Use with Examples, Different Notations of RDF: RDF/XML, N3, NTRIPLES, Turtle. Ontology: What is Ontology? Different Types of Ontology (Upper Ontology, Domain Ontology etc.), Reusability of Ontology, Heterogeneity Problem among Ontologies, Discussion about the Problem and its Solution, Different Building Blocks of an Ontology (Domain Ontology). Linked Data Web and Semantic Web: Introduction to Linked Data, Relation between Linked Data and Semantic Web, Linked Data Principles and Design Consideration, Publishing Linked Data, Consuming Linked Data, Discussion on Traditional Web of Documents and Web of Data. Introduction to Current Research and Development Work going on Semantic Web: Introduction to Different Stages to Develop a Complete Semantic Web Application and Linked Data, Introduction to Different

Available Tools.

**F) Remote Sensing and GIS:** Introduction – Perspectives and concept of remote sensing, special applications. Geophysical Remote Sensing – external fields, magnetic, geophysical remote sensing: Gravity, crust dynamics seismology. Electromagnetic spectrum; The photon, Distribution of Radiant energies, Sensor technology, Spectral signatures- Interpretation and classification. Signatures and Sensors, Image Processing & Interpretation, Fundamentals of image processing, image representation, Spatial domain and transformation domain image processing, Enhancement techniques using soft computing tools in spatial as well as spectral domain, optimization based image processing. Features and classification techniques, GIS Applications, latest trends of GIS applications.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Master of Computer Application**

**Section - II**

**Specialization to Computer Application**

**A) Artificial Intelligence & Soft Computing:** Heuristic search techniques - Generate and test, Hill climbing, Best first search, Problem reduction, Constraint satisfaction, Means-Ends Analysis. Game Playing - Minimax search procedure, adding alpha-beta cutoffs, additional refinements, Iterative deepening. Knowledge Structures - Semantic Networks, Frames, Conceptual Dependency diagrams, Scripts. Genetic Algorithms - Significance of Genetic operators, termination parameters, Evolving Neural nets, Ant Algorithms. Fuzzy Set Theory - Classical & Fuzzy set theory, Interval Arithmetic's, Operations on Fuzzy sets. Natural Language Processing - Steps in NLP, Syntactic processing, Semantic analysis, Discourse and Pragmatic processing, Statistical NLP, Spell checking.

**B) Data Mining and Knowledge Discovery:** Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity. Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN, Classification-Alternative techniques- Nearest Neighborhood classifier, Bayesian Classifier, Support Vector Machines: Linear SVM, Separable and Non Separable case. Cluster Evaluation- Overview, Un-supervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms. Web Data mining- Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search.

**C) Discrete Structures:** Sets, Relations, Functions, Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and partial Orderings, Elementary Counting Techniques, Probability. Models of computation – Finite Automata, Pushdown Automata, Non-determinism and NFA, DPDA and PDAs and Languages accepted by these structures. Grammars, Languages, Non-Computability and Examples of Non-computable problems. Graph- Definitions, paths, connected graphs, regular and bipartite graphs, cycles and circuits, Tree and rooted tree, Spanning tree, Hamiltonian and Eulerian graph, planar graphs.

**D) Software Engineering:** System Development Life Cycle (SDLC) – Steps, Water fall model, Prototypes, Spiral Model. Software Metrics, Software Project Management. Software Design – System design, detailed design, and function oriented design, object oriented design, user interface design, design level metrics. Coding and Testing – Testing level metrics, Software quality and reliability, clean room approach. Software re-engineering.

**E) Semantic Web and Linked data:** Introduction: History of Web, World Wide Web, Internet, Working Mechanism of Web, Importance of Document on the Web, URL, IRI, Namespace, Domain. Semantic Web: What is Semantic? What is Semantic Web? Semantic Web Road Map, Comparison between Semantic Web and Traditional Web, Semantic Web Layer Cake and Their Significance, Vision of Semantic Web, Short Introduction to Ontology. Preliminary Knowledge on XML, RDF, RDFa, Microdata. RDF (Resource Description Framework) & RDF Schema: Introduction to RDF, Different Features and Components of RDF, Detail Study of RDF Class, Property, Instances, Restriction, Domain and Range of Properties and their Use with Examples, Different Notations of RDF: RDF/XML, N3, NTRIPLES, Turtle. Ontology: What is Ontology? Different Types of Ontology (Upper Ontology, Domain Ontology etc.), Reusability of Ontology, Heterogeneity Problem among Ontologies, Discussion about the Problem and its Solution, Different Building Blocks of an Ontology (Domain Ontology). Linked Data Web and Semantic Web: Introduction to Linked Data, Relation between Linked Data and Semantic Web, Linked Data Principles and Design Consideration, Publishing Linked Data, Consuming Linked Data, Discussion on Traditional Web of Documents and Web of Data. Introduction to Current Research and Development Work going on Semantic Web: Introduction to Different Stages to Develop a Complete Semantic Web Application and Linked Data, Introduction to Different Available Tools.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Electrical Engineering, Electrical and Electronics Engineering**

**Section - II**

**Specialization**

**A) Power Systems:**

Modern power system operation and control, static and dynamic modeling, Load flow studies, transient stability and small signal stability of large power systems, Voltage stability: P-V and Q-V curves, static analysis, sensitivity and continuation power flow method. Introduction to optimization techniques, economic load dispatch of thermal and hydro-thermal plants, loss formula, real and reactive power optimization, optimal power flow, unit commitment, power system security constrained optimization, load-frequency control, energy control centers and power system state estimation.

Bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission.

**B) Electrical Machines:**

Single phase transformer - equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers- connections, parallel operation; auto-transformer; energy conversion principles. DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; Three phase induction motors - principles, types, performance characteristics, starting and speed control; single phase induction motors.

Synchronous machines - performance, regulation and parallel operation of generators, motor starting, characteristics and applications Servo and Stepper motors.

**C) Control Systems & Instrumentation:**

Transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis and design: Routh Hurwitz criterion, Root loci, Bode plots. Elements of Proportional Integral Derivative (PID) control. State variable representation and solution of state equation of LTI control systems. Controllability and observability. Pole placement by state feedback.

Static and dynamic characteristics of measurement systems, first order and second order systems, error analysis; electromechanical indicating instruments: AC/DC current and voltage meters, loading effect, extension of instrument ranges, measurement of power and energy; instrument transformers. AC & DC bridges; resistive, capacitive, inductive transducers, and their signal conditioning; digital voltmeter and multimeter, oscilloscope, frequency counter; analog-to-digital and digital-to-analog converters.

**D) Power Electronics & Electric Drive:**

Operating characteristics of power semi-conductor devices, principle of operation of single and three phase ac-dc line commutated converters, introduction to unity power factor converters. Principle of operation dc-dc (buck, boost, buck-boost, fly-back and forward) converters. Principle of operation single phase and three phase dc-ac converters, PWM techniques, basis concepts of adjustable speed dc and ac drives.

**E) Soft Computing:**

Artificial Neural Networks (ANN): Artificial Neural Networks, Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch- Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule. Fuzzy Systems: Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions. Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

**F) Advanced Signal Processing and Applications ( Exclusively for Electrical and Electronics Engineering):**

Discrete time signals and systems, Convolution and frequency response. Discrete time Fourier and z-transforms. Properties, analysis of discrete time systems. The DFT, definition and properties, circular convolution calculation, FFT transform. Relationship between continuous and discrete time systems: sampling time and frequency normalization, discrete time processing of continuous time signals. Difference equation for digital filters definition and properties. FIR filters, IIR filters, Digital filter design techniques: impulse invariance, Bilinear transformation, finite difference, window design methods, introduction to multirate DSP, decimation and interpolation, polyphase decomposition. Adaptive signal processing: time adaptive systems, LMS algorithm. Recursive least squares (RLS) algorithms, least square lattice (LSL) algorithm.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Electronics and Instrumentation Engineering**

**Section - II**

**Specialization**

**A) Process Instrumentation and Process Control:**

Process characteristics: Incentives for process control, Process Variables types and selection criteria, Process degree of freedom, The period of Oscillation and Damping, Characteristics of physical System: Resistance, Capacitive and Combination of both. Elements of Process Dynamics, Types of processes- Dead time, self-Regulating /non self regulating, Linear/non linear, and Selection of control action. Study of Liquid Processes, Gas Processes, Flow Processes, Thermal Processes.

Analysis of Control Loop: Steady state gain, Process gain, Valve gain, Process time constant, Variable time Constant, Transmitter gain. Analysis of Flow Control, Pressure Control, Liquid level Control, Temperature control, SLPC-features, faceplate, functions, MLPC- features, faceplate, functions, SLPC and MLPC comparison.

Review of Systems: Review of first and higher order systems, closed and open loop response. Response to step, impulse and sinusoidal disturbances. Transient response. Block diagrams. Stability Analysis: Frequency response, design of control system, controller tuning and process identification. Bode and Nyquist stability criterion. Special Control Techniques: Advanced control techniques, cascade, ratio, feed forward, adaptive control, Smith predictor, internal model control. Multivariable Control Analysis: Introduction to state-space methods, Control degrees of freedom analysis and analysis, Interaction, Bristol arrays, Niederlinski index - design of controllers, Tuning of multivariable controllers.

**B) Industrial Instrumentation and Automation:**

Introduction to Industrial Automation, Role of automation in industries, Introduction to the types of manufacturing industries, Introduction to type of automation system, Benefits of automation. Introduction to Automation pyramid, Introduction to automation tools like PAC, PLC, SCADA, DCS, Hybrid DCS with reference to automation pyramid, Comparison of PLC, PAC,

and SCADA on the basis of Performance criteria Control system audit, Performance criteria, Development of User Requirement Specifications (URS) for automation. Functional Design Specifications (FDS) for automation tools.

### **C) Process Modeling and Simulation:**

Mathematical models for chemical engineering systems: Introduction, Use of mathematical models, Scope of coverage, Principles of formation, Fundamental laws, Continuity equation, Energy equation, Equations of motions, Transport equations, Equations of state, Equilibrium, Chemical kinetics. Examples of mathematical models of chemical engineering systems: Introduction, Series of isothermal, constant hold up CSTRs, CSTRs with variable hold-ups, Two heated tanks, Gas phase pressurized CSTR, Non-isothermal CSTR, Single component vaporizer, Multi-component flash drum, Batch reactor, Reactor with mass transfer, Ideal binary distillation: Batch distillation with holdup, pH systems. General Concepts of Simulation for Process Design: Introduction, Process simulation models, Methods for solving non-linear equations, Recycle partitioning and tearing, Simulation examples. Computer simulation: Simulation examples, Gravity flow tank, Three CSTRs in series, Non-isothermal CSTR, Binary distillation column, Multi-component distillation column, Batch reactor.

### **D) Biomedical Signal Processing:**

Acquisition, Generation of Bio-signals, Origin of bio-signals, Types of bio-signals, Study of diagnostically significant bio-signal parameters Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, The electrode skin interface and motion artifact, biomaterial used for electrode, Types of electrodes (body surface, internal array of electrodes, microelectrodes), Practical aspects of using electrodes Acquisition of bio-signals (signal conditioning) and Signal conversion (ADC's DAC's) Processing, Digital filtering, Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time-frequency) analysis (Computation of signal parameters that are diagnostically significant), Classification of signals and noise, stationary random signals and non-stationary signals, Principle component analysis, Correlation and regression, Analysis of chaotic signals Application areas of Bio –Signals analysis EEG- frequency component analysis, ECG- QRS detection, R amplitude, interval detection, Phonocardiogram- heart valve disorders etc, EMG analysis.

Sampling theorem, z-transforms, linear shift invariant systems, Correlation and convolution, Signal flow graphs for digital networks, Canonical forms -Design of digital filters -IIR and FIR filters. Image Processing: Acquisition, Image representation, Sampling and Quantization, Histograms, Image Quality, Noise in Images, Image enhancement: Histogram equalization and Contrast Enhancement.

### **E) Transducer Design and Optical Instrumentation:**

Review of transducers for various parameters like temperature, pressure, flow, level, humidity, acceleration, vibration, density etc. Design considerations and selection criterion as per standards, Sensor fabrication techniques, process details, and latest trends in sensor fabrication, fiber optics sensors, electromechanical sensors, Solid state chemical sensors, Bio-sensors, Piezo-resistive sensors, characterization of sensors, effect of sensors on process identification, signal conditioning techniques.

Optical fiber waveguide - total internal reflection, and electromagnetic mode theory of optical propagation, cylindrical fiber, manufacturing of optical fiber. Transmission characteristics of optical fiber -Attenuation, material absorption losses, scattering losses, nonlinear and linear scattering, dispersion, intermodal dispersion, dispersion modified single mode fiber, dispersion flattened fibers, polarization, nonlinear phenomena. Optical sources and detectors - Optical fiber sensors -Introduction to fiber optics sensors, sensors based on intensity modulation, application of optical fiber for displacement, strain, stress and pressure measurement. Active multimode FO sensors, micro-bend optical fiber sensors, current sensors, phase modulated, polarization modulated optical fiber sensors, fiber optic gyroscope. LASER applications - Introduction, application of LASER in biomedical instrumentation, LASER interferometry, performance parameters, LASER telemeters, measurement of distance, LIDAR, holography: basic principle of holography, measurement of strain, stress, bending moments and vibrations using hologram.

### **F) Soft Computing:**

Artificial Neural Networks: Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch - Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule. Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions. Genetic Algorithms: (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Electronics and Telecommunication Engineering**

**Section - II**

**Specialization**

**A) Electronics:**

Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED and photo diode, Basics of LASERS. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.

Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and CMOS. Simple diode circuits, clipping, clamping, rectifiers. Biasing and bias stability of transistor and FET. Amplifiers: Low and High frequency single-and multi-stage amplifiers, differential and operational, feedback amplifiers, Sinusoidal oscillators; criterion for oscillation and power amplifiers. Frequency response of amplifiers. Simple Operational Amplifier (Op-amp) circuits, Function generators and wave shaping circuits, 555 Timers.

**B) Communication Systems:**

Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Basics of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Fundamentals of TDMA, FDMA and CDMA and GSM.

Microwave Tubes and Amplifiers, Principle of working of Radar and Satellite Communication, Basics of Optical Communications, Computer networking, Network management and Mobile communication.

### **C) Digital System Design & VLSI Design:**

Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor (8085, 8086 & 80386) Microcontroller 8051: architecture, programming, memory and I/O interfacing. Real time systems, ARM Processor and controller, Real Time & Database Applications, Microcomputer Embedded System Design, Software Development and Tools for Embedded system, PIC Microcontroller and Interfacing.

Solid State Devices; MOS Circuit design and Layout & Simulation, CMOS Digital Circuit Design, Design of Semiconductor Memories, Mixed Signal and RF Circuit Design, ASIC. Basic MOS Physics and Equivalent Circuits and their Models, VLSI Design Methodologies, Low Power VLSI Design, MEMS and IC Integration , VLSI Design Rules, Floor Planning, MOS Transistor Principles and CMOS Inverter, Combinational Logic Circuits, Arithmetic Building Blocks and Memory Architectures, Interconnect and Clocking Strategies, MOSFET Devices, Nano-Scaled Classical MOSFETs, Non-Classical MOSFETs, Compact Models For Circuit Simulators ,Hardware Descriptive Language .

### **D) Signal and Image Processing:**

Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems. Analog filter design – IIR filter Design & FIR Filter Design. Multi-rate Signal Processing and its Applications

Digital Image Fundamentals, Image Transforms, Image Enhancement- Spatial and Frequency Domain, Image Restoration, Image Segmentation, Image Compression, Computer Vision.

### **E) Microwave Engineering:**

Electrostatics; Maxwell's equations: differential and integral forms, boundary conditions, wave equation, Pointing vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations. Antenna: types and radiation effects.

## **F) Soft Computing:**

Artificial Neural Networks (ANN): Artificial Neural Networks, Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch- Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule.

Fuzzy Systems: Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions.

Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Mechanical Engineering**

**Section - II**

**Specialization**

**A: DESIGN STREAM**

**ADVANCED MECHANICS OF SOLIDS**-Introduction to Three Dimensional Theory of Elasticity Plane stress and Plane strain problems, Differential Equations of equilibrium, strain-displacement relations in Cartesian and polar co-ordinates, Boundary conditions, Shear centre, Torsion.

**ADVANCED THEORY OF MECHANISMS**- Kinematics: Review of determination of velocity and acceleration of points and links in mechanisms- Analytical and graphical methods, Synthesis of Mechanisms, Analysis of Cams: Basic curves, pressure, angle-Cam size determination-Cam profile determination-Analytical and graphical. Static and Dynamic Force Analysis: Forces, Couples. Conditions of equilibrium- Free body diagram. Analysis of 4-bar linkage, slider crank mechanisms,

**VIBRATION**: Introduction, Fundamentals of system modeling, Free Vibration, Forced Vibration, Transient Vibration, Two Degree of Freedom Systems, Multi Degree of Freedom System. Dynamic balancing and alignment of machinery: Dynamic Balancing of Rotors, Field Balancing in one Plane, two Planes, and in several Planes.

**TRIBOLOGY**- Friction: Types of friction - dry-boundary and fluid-laws of friction and friction theories Variables in friction, theories of wear - stages of wear, Lubrication: Role of

lubrication Lubricants, Hydrodynamic bearings, Hydrostatic bearings, rolling element bearings.

**DESIGN ENGINEERING-** Design Fundamentals, , Design considerations – material selection, functional design, cost analysis. Fatigue considerations in design - fatigue in materials – fracture mechanics approach to fatigue – theories of fracture, Introduction to reliability in design – reliability function, failure data analysis, failure distribution functions, MTTF/MTBF, hazard rate and models, methods of improving reliability, reliability testing.

**OPTIMIZATION TECHNIQUES:** Introduction to Optimization, Formulation and Solution methodologies, Single variable optimization, Multivariable optimization with no constraints, with equality constraints and with inequality constraints. Kuhn-Tucker conditions, Lagrange multiplier method. Introduction to integer programming – Gomory’s cutting plane method, branch and bound method.

**FINITE ELEMENT METHOD-** Basic concepts of FEM – a general procedure for finite element analysis, Truss structures: The direct stiffness method, Flexure - elements – elementary beam theory, flexure element, flexure element stiffness matrix and element load vector, Interpolation function for general element formation, one dimensional elements, triangular elements, rectangular elements, three dimensional elements.

## **B: THERMAL STREAM**

**ADVANCED THERMODYNAMICS:** Reversible work - availability - irreversibility and second – law efficiency for a closed system and steady – state control volume. Availability analysis of simple cycles. Thermodynamic potentials. Different equations of state – fugacity – compressibility - principle of corresponding States - fugacity coefficient, Thermochemistry - First law analysis of reacting systems - Adiabatic flame temperature – entropy change of reacting systems.

**ADVANCED ENGINEERING FLUID MECHANICS:** Three dimensional continuity equation - differential and integral forms – equations of motion momentum and energy and their engineering applications. Rotational and irrotational flows, Laminar and turbulent Flow, Boundary Layer.

**ADVANCED HEAT TRANSFER** : One dimensional energy equations and boundary condition - three-dimensional heat conduction equations . radiation in gases and vapour, Momentum and energy equations - turbulent boundary layer heat transfer, heat exchanger , NTU approach

**REFRIGERATION & AIR CONDITIONING SYSTEM DESIGN:**

Estimation of Solar Radiation : Introduction to cooling and heating load calculations, Solar radiation, Solar geometry ,Selection of Air Conditioning Systems: Introduction to thermal distribution systems and their functions, Selection criteria for air conditioning systems, Classification of air conditioning systems.

Design of Air Conditioning ducts.

**COMPUTATIONAL FLUID DYNAMICS HEAT TRANSFER:** Conservation equation mass momentum and energy equations convective forms of the equations and general description. Numerical grid generation basic ideas transformation and mapping. Solution of finite difference equations iterative methods matrix inversion methods ADI method operator splitting fast Fourier transform applications.

## **C: PRODUCTION STREAM**

**THEORY OF METAL CUTTING:** Mechanics of Metal Cutting, Tool Life and Tool Wear, Single Point Cutting Tool, Multipoint Cutting Tool, Grinding, Cutting Temperature, Cutting tool materials Cutting fluids.

**ADVANCED MANUFACTURING PROCESSES:** Non-Traditional Machining.

**ADVANCED METAL FORMING:** Fundamentals of Metal Forming, Rolling of metals, theories of cold and hot rolling, defects in rolling, Forging, forging defects, Extrusion Analysis of Extrusion process, defects in extrusion, Drawing, Sheet Metal forming.

**ADVANCED CASTING AND WELDING TECHNOLOGIES:** Laser Beam Welding, Friction Stir Welding, Electron Beam Welding, Ultrasonic Welding, Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity flow-pressure casting, directional and monocrystal solidification, squeeze casting, semisolid metal casting, rheocasting.

**ADVANCED CAD:** Introduction To Cad, Geometric, Modelling: Synthetic Curves, Surface Modeling, Synthetic Surface, Advanced Surfaces, Transformations, 3-D Modelling, Design Applications.

**COMPUTER AIDED MANUFACTURING:** Compute-Aided Programming, Automatic Tool Path generation, Tooling for CNC Machines- Interchangeable tooling system, Adaptive control of machining processes like turning, grinding.

**QUALITY ENGINEERING IN MANUFACTURING:** Quality Value and Engineering, Tolerance Design and Tolerancing, Analysis of Variance (ANOVA), Orthogonal Arrays, ISO-9000 Quality System.

**OPERATION RESEARCH:** Linear programming, simplex method, transportation and assignment models PERT and CPM.

**FINITE ELEMENT TECHNIQUES:** Introduction to Finite Element Method, Stress and Equilibrium. Boundary conditions, Strain-Displacement relations, Stress-strain relations.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Management**

**Section - II**

**Specialization**

**A: Behavioural Science**

- **Understanding Organizational Behaviour** - Fundamental Concepts, Organizational processes, Organizational structure, Organizational Change and Innovation processes. **Effectiveness in organizations** - Models of Organizational Behaviour, Systems theory and time dimension of effectiveness, Developing competencies, Limitations of Organizational Behaviour, Continuing challenges.
- **Individual differences and work behaviour** - Why individual differences are important, The basis for understanding Work Behaviour, Individual differences influencing Work Behaviour. **Personality** - Sources of personality differences, Personality structure, Personality and Behaviour, Measuring Personality **Attitudes** - The nature of Employee Attitudes, Effects of Employee Attitudes, Studying Job satisfaction, Changing Employee Attitudes. **Perceptions, Attributions and Emotions** - The perceptual process ,Perceptual grouping, Impression management, Emotions, Emotional Intelligence
- **Job Design, Work and Motivation** - Job design and quality of work life, A conceptual model of job design, Job performance outcomes. **Evaluation, Feedback and Rewards** - Evaluation of Performance, Performance Evaluation feedback, Reinforcement theory A model of Individual rewards, Rewards Affect Organizational concerns, Innovative reward system. **Managing misbehaviour** - The emergence in Management of the study of misbehaviour, Selected misbehaviours. **Stress and Counselling** - What is stress?, Stress model, Work stressors, Stress outcomes, Stress moderators, Stress prevention and management, Employee counselling, Types of counselling
- **Informal and Formal Groups** - Group Dynamics, The nature of informal, Organizations, Formal groups. **Teams and Team Building** - Organizational context for teams, Teamwork, Team building. **Managing Conflict and Negotiation** - Conflict in Organizations, A contemporary perspective on intergroup conflict, What causes ntergroup conflict, **Power and Politics** - The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics,

- power and politics, Using power to manage effectively. **Empowerment and Participation** - The nature of empowerment and participation,
- **Communication** - Communicating within organizations, Information richness, **Decision Making** - Types of decisions, A Rational Decision-making Process, Behavioural influences on decision making, Group decision making, Creativity on group decision making. **Leadership** - What is leadership, Trait approaches, Behavioural approaches, Situational approaches, Other perspectives, concepts and issues of leadership.
  - **Organizational Structure and Design** - Designing an organizational structure, Division of labour, Delegation of authority, Departmental biases, Span of control. **Managing Change and Innovation** - Change at work, Resistance to change, Alternative change management approaches, Learning principles in change management, **Organizational behaviour across cultures** - Conditions affecting multinational operations, Managing International Workforce.

## **B: Entrepreneurship**

The Entrepreneurial Development Perspective: Concept of Entrepreneurship and Development, Conceptual models of entrepreneurship Role of Entrepreneur in Indian economy and developing economies Tiny & SME & Its Contribution in the National Economy; Corporate Entrepreneurship

Entrepreneurial team – matching human resources needs and skills. Identifying business opportunities and planning for business service & production. Business promotion – process – stages – facilities and incentives. Creating Entrepreneurial Venture, Business Planning Process, Environmental Analysis – Search and Scanning; Identifying; Stages in starting the new venture. Project Management a) Meaning, Objectives and How to choose a project b) Technical, Financial, Marketing, Personnel Feasibility c) Estimating and Financing Funds requirement. Schemes offered by various commercial banks and financial institutions.

Role of Central Govt. and State Govt. in Promoting Entrepreneurship; Introduction to various incentives, subsidies and grants, Promotion of Export oriented units; Fiscal and Tax concessions Role of Govt.

Problems of Entrepreneurs- Marketing, Finance, Human Resource, Production, Research and External Problems, beginning and growth as a entrepreneur.

## **C: FINANCE MANAGEMENT**

- **Management Accounting:** Nature and scope of costing; Cost concepts and Classifications; Usefulness of Costing to Managers, **Marginal costing:** Break—even analysis, decision involving alternative choices. **Budgeting:** Types of budgets and their

preparation, Performance budgeting and Zero-base budgeting. **Ratio analysis:** Liquidity, profitability and solvency.

- **Financial management:** Objectives of financial management; Time value of money, sources of finance, **Investment decisions:** Importance, Difficulties determining cash flows, methods of capital budgeting **Risk analysis :** Cost of capital; Concept and importance, Computations of cost of various sources of finance; Weighted Average Cost of Capital; **Capital Structure decisions;** Theories of capital structure, Factors determining capital structure.
- **Stock Market:** Introduction to Indian Stock Market, scope and features of an investment program, investment risk, interest risk, market risk, inflation risk, default risk, systematic and unsystematic risk, problems related to risk and return. **Corporate Risk Management:** Introduction and overview.
- **Corporate Finance:** Basic Concepts; Valuation Methods; Value Creation and New Valuation Tools; Alternative Valuation Approaches to Specific Cases. Optimum capital structure; **Management of working capital** - Cash, Receivables and Inventory Management, Internal Financing and Dividend Policy; Financial Modeling.
- **Taxation:** introduction, basic concepts and theories, direct taxation and Indirect taxation, tax management.
- **Banking and Insurance:** concepts of banking institutions and insurance policies and products in the market. Overview of Indian financial systems and insurance markets, basic issues in banking, regulations in banking and insurance.
- **Foreign exchange market:** introduction and overview of Structure, types of transactions, International monetary system: Introduction, exchange rate regimes,
- **Derivatives** its introduction & meaning, Characteristics, Types, Derivative Market in India, Functions of Derivative Market, Significance of Derivatives, Traders in Derivatives Market.

## **D: Human Resource Management**

Human Resource Management – Significance; Objectives, Function; A Diagnostic Model; External And Internal Environment. Forces And Influences; Organizing HRM Function

Recruitment And Selection- Sources Of Recruits; Recruiting Methods; Selection Procedure; Selection Tests; Placement And Follow Up.

Performance Appraisal System- Importance And Objectives; Techniques Of Appraisal System; New Trends In Appraisal System.

Evaluation Of Performance For Development-Competency Mapping;

Development Of Personnel- Objectives; Determining Needs; Methods Of Training And Development Programmes; Evaluation.

Human Resource Development- HRD Structure; Functions; Systematic approach to Needs Assessment; Training Program Design; Evaluating HRD Programs; Evaluation Process; Training Outcomes; Potential Legal Issues Related To Training; Cross-Cultural Training; The Future Of Training And Development

Career Planning and Development – Concept of Career; Career Planning and Development Methods.

Compensation And Benefits- Job Evaluation Techniques; Wage And Salary Administration; Fringe Benefits; Human Resource Records And Hr Audit.

Employee Discipline- Importance; Causes and Forms; Disciplinary Action; Domestic Enquiry.

Grievance Management- Importance; Process and Practices; Employee Welfare and Social Security Measures.

Labour and Social Security Laws- The Employees Provident Fund & Miscellaneous Provisions Act, 1952; Employees State Insurance Act, 1948; Factories Act, 1948; Payment Of Gratuity Act, 1972; Employee's Compensation Act, 1923; Maternity Benefit.

Industrial Relations- Importance; Industrial Conflicts; Causes; Dispute Settlement Machinery. Trade Unions – Importance of Unionism; Union Leadership; National Trade Union Movement. Collective Bargaining – Concept; Process; Pre Requisites; New Trends in Collective Bargaining.

Industrial Democracy and Employee Participation – Need for Industrial Democracy; Prerequisites for Industrial Democracy; Employee Participation – Objectives; Forms Of Employee Participation.

Future of HRM – Six Sigma Practices; Flexible Work Options, Virtual Organization.

## **E: Marketing Management**

- **Marketing:** Introduction & overview; Marketing philosophies; Marketing management process; Concept of marketing mix.

- **Consumer Behavior:** Introduction & overview; factors influencing consumer-buying behavior; consumer-buying process; The consumer research paradigms and process; **Consumerism**
- **Marketing Research:** Introduction & overview; Marketing research Process; Applications of Marketing Research.
- **Distribution & Inventory Management:** Introduction & overview; Marketing Channels: Defining and importance; Functions of marketing channels.
- **Industrial Marketing:** Introduction; Overview & Functional Applications.
- **Services Marketing:** Introduction & Overview; Growth of service sector economy; Classification of service marketing mix; Service Quality Gap Model; **Event Management; Hospitality & Hotel Management.**
- **Advertising and Sales Promotion:** Integrated marketing communications concepts; Basics of Advertising; Creativity strategy; Sales Promotion.
- **Sales Management:** Introduction & overview; Selling Skills; Selling process; Sales Force management.
- **Customer Relationship Management:** Introduction & overview; Types of CRM; CRM Strategies & Models.
- **Retail Marketing:** Basics; Retail Format & Types; Supply Chain Management; Software for Merchandise.
- **Rural & Agro Marketing:** Rural Market; Rural Marketing Index; Agri Business & Marketing; Government support to Agri Business.
- **International Business Marketing:** Theories of international trade; Role of multinationals, Trade Policies, Balance of Payment, Trade Deficits, Regulatory framework, tariffs & quotas
- **Social Marketing:** Introduction & overview; Working on Non-Profit organization; NGOs.
- **Social Media & Internet Marketing:** Internet Age of marketing; Data Mining in Marketing; Social Media Marketing; Online marketing.

- **Travel & Tourism Marketing:** Changing facets of Tourism; Tourism Development; Travel Agency and Tour Operator
- **Product & Brand Management:** Product Management; Product Strategy; PLC; Branding; Brand Equity.
- **Corporate Communications:** Media Relations; Management and Surveillance; Web based Communications.
- **Direct & Network Marketing:** Introduction; Overview; Functional Applications.
- **Green Marketing:** Introduction; Overview; Functional Application.

## **F: Operation and Production Management**

Deterministic Model in Operation research-Linear Programming (Graphical Method, Simplex method, Duality Theory, Sensitivity Analysis), Network Flow (CPM), Transportation Model, Assignment Model

Probabilistic Models in Operation Research-Probability Theory, Decision Theory, Network Flow (PERT), Queuing Model, Simulation Techniques

Game Theory, Integer Programming, Dynamic Programming, Non linear Programming

Role and Scope of Production Management; Facility Location; Layout Planning and Analysis; Production Planning and Control – Production Process Analysis; Demand Forecasting for Operations; Determinants of Product mix; Production Scheduling; Work measurement; Time and Motion Study; Statistical Quality Control.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Applied Chemistry**

**Section –II**

**Specialization**

**A: Reaction dynamics and surface chemistry**

**Reaction Kinetics:** Introduction, Rates of chemical reactions, Methods of determining rate laws, Mechanisms of chemical reactions and steady state approximation, Laws of photochemistry, Kinetics of photochemical and composite reactions, Chain and oscillatory reactions, Collision and transition state theories, Stearic factor, Treatment of unimolecular reactions, Ionic reactions: salt effect. Homogeneous catalysis and heterogeneous catalysis, free radical polymerization, enzyme catalysis, and reaction dynamics. Effect of pressure on reaction rate, Kinetics of catalytic reactions, Kinetics of surface reaction, autocatalysis, unimolecular and bimolecular surface reaction.

**Fast Reaction:** Luminescence and Energy transfer processes, Study of kinetics by stopped-flow technique, Relaxation method.

**Adsorption:** Surface tension, Capillary action, Gibbs adsorption isotherm, Estimation of surface area (BET equation), Surface films on liquids (Electro-kinetic phenomenon), Catalytic activity at surfaces.

**Properties and stability of colloids,** Surface active agents, Reverse micelles, Critical micellar concentration (CMC), Factors affecting the CMC of surfactants, Thermodynamics of micellization, Micro emulsion.

**Course Outcome:** The students will acquire knowledge of

1. Mechanism for chemical reactions for optimizing the experimental conditions.
2. Application of homogeneous and heterogeneous catalysis in chemical synthesis
3. Importance of adsorption process and catalytic activity at the solid surfaces
4. Concept of colloidal material and their stability for many practical uses.

### **Recommended Books**

1. *Atkins, P.W., Physical Chemistry, W.H. Freeman (1990).*
2. *Laidler, K.J., Chemical Kinetics, Dorling Kingsley (1998).*
3. *Rajaraman, J., and Kuriacose, J., Kinetics and Mechanism of Chemical Transformations, McMillan (2008).*
4. *Moroi, V., Micelles Theoretical and Applied Aspects, Springer (1986).*
5. *Gowarikar, V.A., Vishwanathan, N.V., and Sreedhar, J., Polymer Science, New Age International (1986).*

## **B: Organic Chemistry**

**IUPAC Nomenclature** of Simple Organic and Inorganic Compounds.

**Concept of Chirality:** Recognition of symmetry elements and chiral structures, R-S nomenclature, diastereoisomerism in acyclic and cyclic-systems, E-Z isomerism. Conformational analysis of simple cyclic (chair and boat cyclohexanes) and acyclic systems, Interconversion of Fischer, Newman and Sawhorse projections.

**Stereochemistry and Conformational Analysis:** Newer methods of asymmetric synthesis (including enzymatic and catalytic nexus), enantio- and diastereo selective synthesis. Effects of conformation on reactivity in acyclic compounds and cyclohexanes.

**Aromaticity:** Huckel's rule and concept of aromaticity : annulenes and heteroannulenes, fullerenes. (C<sub>60</sub>)

**Organic reaction mechanisms:** Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes. Addition, elimination E<sub>1</sub>, E<sub>2</sub> and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.

**Named reactions and rearrangements:** Aldol, Perkin, Stobbe, Dieckmann condensations, Hofmann, Schmidt, Lossen, Curtius, Beckmann and Fries rearrangements; Reimer – Tiemann, Reformatsky and Grignard reactions. Diels-Alder reactions; Claisen rearrangements; Friedel–Crafts reactions and Wittig reactions. Routine functional group transformations and interconversions of simple functionalities. Hydroboration, Oppenauer oxidations; Clemmensen, Wolf-Kishner, Meerwein – Ponndorf – Verley and Birch reductions.

**Organic transformations and reagents:** Use of the following reagents in organic synthesis and functional group transformations; Complex metal hydrides, Gilman's reagent, Lithium dimethylcuprate, Lithium di-isopropylamide (LDA) dicyclohexylcarbodiimide. 1,3 – Dithiane

(reactivity umpolung), trimethylsilyl iodide, tri-n-butyl tin hydride, Woodward and Povung hydroxylation, osmium tetroxide, DDQ, selenium dioxide, phase transfer catalysts, crown ethers and Merrified resin, Peterson's synthesis, Wilkinson's catalyst, Baker's yeast.

**Pericyclic Reactions:** Selection rules and stereochemistry of electrocyclic reactions, cycloaddition and sigmatropic shifts, Sommelet-Hauser, Cope and Claisen rearrangements.

**Photochemistry:** Principles of energy transfer, cis-trans isomerization, Paterno-Buchi reaction, Norrish Type I and II reactions, Photo reduction of ketones, di-pi-methane rearrangement, photochemistry of arenes.

**Heterocycles:** Synthesis and reactivity of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole. Skraup synthesis, Fischer indole synthesis.

**Chemistry of natural products:** Familiarity with methods of structure elucidation and biosynthesis of Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenoids, steroids, alkaloids, cholesterol and hormones. Function and application of enzymes and coenzymes.

**Spectroscopy:** Combined applications of mass, UV-VIS, IR and NMR spectroscopy for structural elucidation of compounds.

## References

1. R.T. Morrison and R. N. Boyd's, **Organic Chemistry**, 6th ed., Spring 2008.
2. I.L. Finar, **Organic Chemistry Vol. I & II**, 5th ed, Pearson Education, Singapore, 2004.
3. Micheal B.Smith and Jerry March, **March's Advanced Organic Chemistry Reactions, Mechanisms and Structure**, 6th ed., JohnWiley&Sons Inc., New Jersey, 2007.
4. Peter Skyes, **A Guide book to Mechanism in Organic Chemistry**, Orient Longman Private Limited., New Delhi, 2003
5. J.M.Coxon and B. Halton, **Organic Photochemistry**, 2nd edition, Cambridge University Press, 2011.
6. Jagdamba Singh, **Photochemistry and Pericyclic Reactions**, 3rd edition, New Age Science, 2009.

## C: Environmental Chemistry

## **Unit-1**

**Ecosystem** : Structure and function of ecosystem , Food chain, Food web, Energy flow, biogeochemical cycle, Biomagnification.

## **Unit-2**

**Air** : Natural and anthropogenic sources of pollution. Primary and Secondary pollutants, Transport and diffusion of pollutants, Methods of monitoring of air pollution SO<sub>2</sub> , NO<sub>x</sub> , CO, SPM Effects of pollutants on human beings, plants, animals, materials and on climate, Air Quality Standards.

## **Unit-3**

**Water** : Sources, types and consequences of water pollution (ground water and surface water). Sampling and physico-chemical analysis of water quality. Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, Heavy metal pollution, surfactant and their toxicity, Water Quality Standards.

## **Unit-4**

**Soil** : Soil and soil profile, Trace metals and organic matter in soil, Physico-chemical analysis of soil Industrial waste effluents and heavy metals their interactions with soil components. Different kinds of synthetic fertilizers (N,P & K) and pesticides and their interactions with different components of soil.

## **Unit-5**

**Solid Waste:** Sources and generation of solid wastes, their characterization, chemical composition and classification of municipal and hazardous wastes, Different methods of disposal and management of solid wastes – sanitary landfill, incineration, composting, pyrolysis

### **Suggested Books –**

1. Standards methods for the Examination of Water and Wastewater, APHA / AWWA / WPCF Publishing, 19th Ed. 1995.
2. Quantitative organic analysis : Qualitative inorganic analysis : Qualitative organic analysis, series By – Vogel's.
3. Analysis of Chemicals by Vogel P.K.Goel , Water Pollution Causes Effects and Control. New Age International,2009.
4. M. Petrovic and D. Barcelo, The handbook of Environmental Chemistry.
5. Meyers A. Robert (Eds.) Encyclopedia of Environmental Analysis and Remediation Vol. 1-8, John Wiley & Sons, 1998

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Applied Mathematics**

**Section - II**

**Specialization**

**A: Celestial Mechanics**

1. **Lagrange and Hamilton Equations:** Introduction; Classification of a Dynamical System; Lagrange's Equations for Simple Systems; Principle of Virtual Work- D' Alembert's Principle; Lagrange Equations for General Systems; Hamilton's equations; Ignorable Coordinates; The Routhian Function.
2. **Hamiltonian Methods:** Introduction; Hamilton's Principle—Hamilton's Principle for Conservative System, Principle of Least action; Characteristic function of Hamilton-Jacobi Equation; Phase Space and Liouville's Theorem; Special Transformations—Lagrange and Poisson Brackets; Calculus of Variations.

**B: Fuzzy Logic / Game Theory/Algebra**

1. Sets and mappings
  - a. Sets
  - b. Relations
  - c. Mappings
  - d. Binary Operations
  - e. Cardinality of sets
2. Matrices
  - a. Matrices
  - b. Operations on matrices
  - c. Determinant function
  - d. Properties of Determinant function
3. Groups
  - a. Semi groups and groups
  - b. Homomorphism
  - c. Subgroups and cosets

- d. Generators and relations
  - e. Normal subgroup
  - f. Direct products
  - g. Sylow's Theorem
4. Rings
- a. Definitions and elementary properties
  - b. Subrings and characteristics of a ring
  - c. Ideals and Homomorphism
  - d. Sub modules
  - e. Polynomial ring
5. Modules and vector spaces
- a. Definitions and examples
  - b. Sub modules and direct sums
  - c. Free modules
  - d. Representation of linear mapping
6. Fuzzy Sets
- a. Definition and examples
  - b. Operations on Fuzzy Sets
  - c. Zero person game
  - d. Two person game
  - e. n-person game

References:

1. Bhattacharya P.B., Jain S.K. :Basic abstract algebra, Cambridge University Press
2. Lotfi A. Zadeh : Fuzzy Sets information and control, 1965
3. Von Neumann, J: Theory of games and economic behavior, Princeton University Press, 1947

## **C: FIXED POINT THEORY AND APPLICATION**

**Topological Spaces:** open sets, closed sets, neighbourhoods, bases, subbases, limit points, closures, interiors, continuous functions, homeomorphisms.

**Quotient Topology:** Construction of cylinder, cone.

**Connectedness and Compactness:** Connected spaces, Connected subspaces of the real line, Components and local connectedness, Compact spaces, Heine-Borel Theorem, Local - compactness.

**Separation Axioms:** Hausdorff spaces, Regularity, Complete Regularity, Normality, Urysohn Lemma, Tychonoff embedding and Urysohn Metrization Theorem, Tietze Extension Theorem.

**Complete metric spaces:** Function spaces, Characterization of compact metric spaces, equicontinuity.

**Normed spaces:** Continuity of linear maps. Hahn-Banach Extension and Separation Theorems. Banach spaces. Dual spaces and transposes. Uniform Boundedness Principle and its applications. Closed Graph Theorem, Open Mapping Theorem and their applications.

**Inner product spaces:** Hilbert spaces. Orthonormal basis. Projection theorem and Riesz Representation Theorem.

**Fixed Point Theorems with Applications:** Banach contraction mapping theorem, Brouwer fixed point theorem, Leray-Schauder fixed point theorem. Calculus in Banach spaces, Gateaux as well as Frechet derivatives, chain rule, Taylor's expansions, Implicit function theorem with applications, subdifferential.

**Fuzzy Logic:** Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations. Propositional logic and Predicate logic, fuzzy If – Then rules, fuzzy mapping rules and fuzzy implication functions, Applications.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI**

**Syllabus for Entrance Examination in Ph.D. Programme**

**Discipline: Applied Physics**

**Section - II**

**Specialization**

**A: Biomedical Physics**

- 1 Concept of Quantum theory, Wave particle duality, Photoelectric effect, de Broglie Wave , Compton effect , Compton scattering, X-rays ,Properties of X-Rays, Practical Application of X-Rays. Types of indirectly ionizing photon radiation
- 2 Important derived physical constants and relationships, Speed of light in a vacuum: Reduced Planck's constant  $\times$  speed of light in a vacuum: Fine structure constant: Bohr radius: Rydberg energy: Rydberg constant: Classical electron radius: Compton wavelength of the electron: Classification of radiation: Non-ionizing radiation (cannot ionize matter). Ionizing radiation (can ionize matter either directly or indirectly):
- 3 Photon fluence and energy fluence, KERMA, Absorbed dose, Stopping powers, radiation dosimeter, Ionization chambers, TLDs,
- 4 X ray machines for radiotherapy, Gamma ray beams and Gamma ray units
- 5 Radioactivity: Modes of radioactive decay, Radiosurgical techniques, Gamma Knife, Linac based radiosurgery

**Reference Books** : 1 ATTIX, F.H., Introduction to Radiological Physics and Radiation Dosimetry, Wiley.

2. KHAN, F.M., The Physics of Radiation Therapy, Lippincott, Williams and Wilkins

3. HORTON, J., Handbook of Radiation Therapy Physics, Prentice Hall, New York .

**B: Nano Science & Applications**

**Unit no. 1: Nanotechnology**

- 1.1 Introduction 1.2 Emergence of nanotechnology 1.3 Bottom up and Top down approaches 1.4 Zero dimensional nanostructures: nanoparticles

### **Unit no. 2: Nanowires and nanorods**

2.1 Introduction to one –dimensional Nanostructures 2.2 Evaporation – condensation growth 2.3 Dissolution – condensation growth 2.4 Vapor (or solution )- liquid-solid (VLS or SLS) growth 2.5 Templet based synthesis

### **Unit no. 3: Thin films**

3.1 Introductoin to Two – Dimensional Nanostructures 3.2 Fundamentals of film growth 3.3 Physical Vapor Deposition (PVD) 3.4 Chemical Vapor deposition (CVD) 3.5 Atomic Layer deposition (ALD) 3.6 Electrochemical deposition 3.7 Sol- Gel films

### **Unit no. 4: Characterzation and Properties of Nanomaterials**

4.1 Structural characterization (XRD, SEM, TEM) 4.2 Chemical Characterization (Optical spectroscopy , Electron spectroscopy) 4.3 Physical properties of nanomaterials 4.4 Electrical conductivity

### **Unit no. 5: Application of nanomaterials**

5.1 Molecular Electronics and nanoelectronics 5.2 Nanobots 5.3 Biological applications of nanoparticles 5.4 Bandgap engineered quantum device 5.5 Nanomechanics

### **Reference Book**

Nanostructures and nanomaterials: Synthesis, properties and application : Cuozhong Cao

Thin Film Fundamentals : A. Goswami

Nanophysics and Nanotechnology: An introduction to modern concept in nanoscience: Edward L. Wolf

## **C: Luminescence & Applications**

Types of luminescence. *Luminescent* Materials. Resonance, spontaneous, and stimulated luminescence. Three- and four-level luminescence. Chemiluminescence, electroluminescence (cathodoluminescence), mechanoluminescence, photoluminescence (fluorescence, phosphorescence), radioluminescence, sonoluminescence, thermoluminescence. X-ray fluorescence analysis, fluorescence yields for K and L shells.

Thermo luminescence - models: Jablonski model, Configuration-coordination model, energy band model, thermoluminescence mechanisms, Method of analysis; methods using different rates, half width method, initial rise method, Applications of thermoluminescence in radiation dosimetry and dating

Mechanoluminescence: Mechanoluminescent materials, Characteristics, mechanisms, theories of Mechanoluminescence, applications. Lyoluminescence, LL reader, Inorganic lyoluminescence phosphors, mechanisms, enhancements and spectra

## **D: Solid State Ionics & Material Science**

## 1. **Experimental Material Science :**

Material Preparation and characterization studies and solid-state electrochemical device applications viz. solid state batteries. supercapacitor, light emitting

electrochemical cell of ionic composites, nano-composites, ionic polymers and

polymer nano-composite electrolyte materials.

## 2. **Theoretical Material/Nano-material Science :**

**(i) Mathematical -Modeling:** Mathematical modeling and evaluation of transport

properties of some ionic/superionic solids by using space charge depolarization

method. Modeling of electrochemical devices viz. solid state batteries, super

capacitors and sensors are also in progress.

**(ii) DFT based first principle studies :** Molecular structure, electronic/electrical,

mechanical, optical and transport properties using density functional based

approach of nano-materials, biomaterials, ionic/super-ionic solids and

electronic/ionic conducting polymers implemented in SIESTA / transiesta

software.

**(iii) Molecular mechanics and Molecular dynamic simulation** of polymer nano-

composite materials for solid state battery, super capacitor, organic light

emitting diode(OLED), light emitting electrochemical cell (LEEC) applications.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY  
BHILAI**

**Syllabus for Entrance Examination for Admission in Ph.D. programme**

**Discipline: Pharmacy**

**Section - II**

**Specialization**

**A) Pharmaceutics**

Recent advances in solid dosage form manufacturing. Principle and technology involved in Disperse systems, Molecular dispersion, emulsion- micro and multiple emulsion. Design and fabrication of Oral controlled release drug delivery systems. Parenteral products and Ocular drug delivery systems. Implantable products, Transdermal therapeutic system. Prodrugs as sustained chemical delivery system, Biochemical and Molecular approach to Controlled Drug delivery. Drug kinetics in coarse disperse systems, drug diffusion in coarse disperse systems.

Dosing considerations and bioavailability assessment. Transport of drugs through membranes and barriers other than GI Tract, Buccal absorption, Salivary excretion of drugs, excreting of drugs via sweat, excretion of drugs in to milk, penetration of drugs into eye, transfer across placenta, passage of drugs into and out of cerebrospinal and brain. Consideration of one, two and multiple compartment model on Intravenous administration, Intravenous infusion and first order absorption of single dose.

**B) Pharmacognosy**

Plant growth regulators. Origin of secondary metabolism in relation to the basic metabolic pathway. Methods of investigation of biosynthetic pathway such as tracer techniques and autoradiography, biogenesis of some important secondary metabolites, stress compound. WHO guidelines for assessment of crude drug. Mutation – polyploidy and hybridization in relation to the improvement of vegetable drugs, chemical rashes. Cell – tissue culture techniques role of plants growth regulators, micro-propagation of medicinal and aromatic plants, germplasm storage and methods of cell immobilization.

**C) Pharmacology**

Clinical Pharmacokinetics: Dose – response in man, Influence of renal and hepatic disease on pharmacokinetics, Therapeutic drug monitoring, Population pharmacokinetics. Adverse drug reactions: Definition and classification, epidemiology, predisposing factors, mechanism of ADR & different types of ADR. Statistical treatment of model problems in evaluation of drugs. Methods of biological assay, principles of biological assays with certain examples. Development of new bioassay methods. Receptors, ion channels and

their modulators i.e. calcium, potassium, sodium and chloride channels, enzymes and carrier proteins, mechanism of signal transduction.

#### **D) Quality Assurance**

General principles of validation of processes- manufacturing & analytical, and products. Calibration of instruments, equipments, etc. & their validation. Types of validation - prospective, concurrent, retrospective and revalidation. Genesis of Quality control and Quality Assurance. Concept of Total Quality Management; CGMP and GLP, ICH and ISO 9000. Statistical Quality Control. Types of sampling systems/plans followed and interpretation.

#### **E) Pharmaceutical Chemistry**

Historical perspective, Drug Discovery Strategies in Direct Drug Design (Structure based) and Indirect drug design, Target selection and lead identification, Natural product sources, Fermentation / Microbial sources, Synthetic, Introduction to pharmacogenomics. QSAR: Parameters, Lipophilicity, electronic, steric factors, Quantitative Models, Hansch analysis, Free Wilson Analysis, Mixed approach, Other QSAR Approaches, Applications of Hansch Analysis, Free Wilson Analysis.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

Syllabus for Entrance Examination for Admission in Ph.D. programme

## Discipline: Environmental Engineering

### Section - II

### Specialization

**Water Pollution Mitigation & Management:** Water pollution – sources, Type and properties, Water quality standards, Industrial activities and mitigation measures, Solid waste management, Air pollution and control, Environmental impact assessment (EIA), EIA processes and stage, Project cycle, Environmental management plan, Sources & Characteristics of Water Pollution, Water Quality & Standards, Industrial Activity & Mitigation Measures, Water Pollution Regulations, Role of Regulatory Boards- Local bodies-CPCB-TWAD, Board–CMWSSB.

**Wastewater & Solid Waste Management:** Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater generation rates, characterization and variables – Population equivalent – Toxicity of industrial effluents and Bioassay tests, Industrial Pollution Prevention, Industrial Wastewater Treatment, Wastewater Reuse and Residual Management, Municipal Solid Waste Management systems, Collection and Transport of Solid Waste, Process of Solid Waste and Energy recovery, Disposal of Solid wastes, Designated waste landfill remediation. Integrated waste management facilities. TCLP tests and leachate studies. Economics of the on-site v/s off site waste management options. Natural attenuation process and its mechanisms.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY  
BHILAI**

**Syllabus for Entrance Examination for Admission in Ph.D. programme**

**Discipline: Water Resources Engineering**

**Section - II**

**Specialization**

**Surface water and Groundwater Hydrology:** Hydrograph analysis, Synthetic hydrographs, Instantaneous unit hydrograph, Infiltration indices, Flood control measures, Flood routing, Flood forecasting, Time series analysis, Continuity equation, Equation of motion and Dupuit equation for seepage flow, Well losses & well hydraulics. Trend Analysis; Empirical Orthogonal Functions, Principal Component Analysis; Canonical Correlation; Statistical Downscaling with Regression, Floods, Droughts, Drought Indicators, Heat waves, Climate Extremes.

**Remote Sensing geographical information system (GIS) and Open Channel Flow:** Boundary layer Analysis, Concept of lift and drag Non-uniform flow in open channel, Forces on immersed bodies, Uniform flow and Non-uniform flow, Gradually varied flow and water surface profiles, Specific energy curve, Hydraulic jump, Reservoir operation and system analysis. Principal of remote sensing, Fundamental laws, Atmospheric window, False colour concept, Multi spectral imaging, Visual interpretation, Digital image processing, Vector and raster images, GIS and its applications.

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# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

Syllabus for Entrance Examination for Admission in Ph.D. programme

## Discipline: Architecture

### Section - II

### Specialization

**Contemporary world architecture, related theories and trends:** Modernism and international style, Bauhaus school, De Stijl movement; Architectural works and philosophies of master architects. Late Modernism: Concepts, relationships to modernism, influences, debates on ornamentation, sculptural forms, slick tech architecture, late modern space, architectural works and philosophies of late modern architects. Post Modernism: Concepts, relationships to modernism, influences, double coding style, critical regionalism, neo vernacular, ad hoc urbanism, architectural works and philosophies of post modern architects. Advanced Theories in Contemporary Architecture: Deconstructivism, biomimicry, blobitecture, parametric design, Möbius strip, trends in high rise structures, architectural works, emerging building typologies. Indian Modernism: Post independence modernist architecture; Architectural works and philosophies of modern Indian architects.

**Built Environment:** Definition, issues and impacts of built environment - physical impacts on water, air, land, noise, natural environment; social impacts (stress); environmental degradation. **Sustainability:** Sustainability and its various dimensions (economic, social and ecological); History of sustainability; Sustainable development; Global warming and climate change; Sustainable architecture and built environment; Culture and sustainability

**Introduction to Urban Public Spaces:** Their need and socio-cultural economic and environmental relevance. **History of Urban Public Spaces:** Urban public spaces in traditional and historical settlements. **Types of Urban Spaces:** Classification based on functions, morphological characteristics etc, **Public Spaces in Contemporary Indian Cities:** Their characteristics, problems and issues. **Place Making:** Concept; Sense of Place; Guiding principles; **Public Space Management:** Need and different approaches to public space management.

Various aspects of urban design; relationship of urban design to architecture, planning and landscape; Evolution of professional discipline; Role and types of urban design guidance. Review of urban forms, patterns and spaces in different periods of history viz. ancient river valley civilization, Greek, Roman, Medieval, Renaissance, Baroque, post industrial revolution period in Europe and India and their influencing factors. Urban form, townscape, urban spaces, streetscapes, building forms and facades, public art. Public perception; Imageability and townscape; Sense of place, Modern examples of urban settlements, town centers and urban spaces in India and foreign countries. Salient urban design paradigms, principles, tools and techniques. Types of megastructures across the globe. Simulation tools for Whole Building Simulation as per ASHRAE 90.1 and ECBC. Contemporary urbanization; New urbanism; Urban growth, density and sustainability; Inequality, segregation and diversity; Informality; Environment and infrastructure.

History of Conservation Movement: Evolution of architectural and urban conservation; Restoration of historic contexts; Salient early examples of conservation of building and sites in Italy, UK and other countries. Architectural Conservation: Research, documentation, analysis and interpretations related to historic buildings and sites; Technical aspects covering traditional building materials; Structural repairs, maintenance and upgradation of historic structures. Urban Conservation: Heritage development within the context of continuity and change; Study of context and processes of urban conservation projects in India and other countries; Critical regionalism; Conservation policies, laws and professional norms; Cultural heritage strategies in the context of urban development.

Project Formulation and Appraisal: Relationship between projects and planning issues: market analysis, technical analysis; Supporting infrastructure requirements; Social cost benefit analysis. Regulatory Frameworks & Guidelines: Contracts Act; Labour Regulations; Arbitration act; Developer's bill; Environmental Management Plan (EMP); ISI standards and its application to Indian context.

Universal Design for India: Universal design India principles and their applications in diverse socio-cultural environments, rural and low-income contexts. Accessibility Standards and Design Guidelines: Accessibility codes of various architectural and design elements like parking, entrance, ramps, toilets, signage, staircase, corridors, etc.; Review of national & international accessibility codes & guidelines. Research Methods in Accessibility Planning: Ethnographic research methods; Trace Study; Precedent analysis; Evidence based research methods; Reliability and validity; Scaling techniques; Usability Rating Scale (URS), Functional Independence Measure (FIM), Functional Performance Measure (FPM); Analysis.

City level Housing and land Strategy: Studying housing subsystems, estimation of housing shortage, project housing and land requirement, prepare alternative scenario's for housing development and formulate strategy. Demography: Fundamental concepts of demography and its elements for planning. Quantitative techniques: Analytical and Quantitative techniques and its application in town planning.

Transportation: Types of transport systems, transport problems and mobility issues; Urban form and Transport patterns, land use – transport cycle; Transport planning process, environment and safety issues; principles of traffic management. Water and storm water management: Sources of water, treatment and storage, transportation and distribution, quality; Storm water – rainfall data interpretation, storm water collection and disposal, water harvesting, recycling and reuse. Solid and other wastes: Generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse; Sustainability issues. Social infrastructure: Typologies, Planning for educational, health, recreational and Socio-cultural facilities. amenities for urban and rural settlements.

Disaster resistant housing: Disaster resistant housing construction practices and codes, engineered and non-engineered structures, preparedness for climate change, architectural and structural requirement in the design of housing.

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**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI**  
**Syllabus Index Section - II (Specialization)**

S.No	Discipline	Specialization
1	Applied Chemistry	Reaction dynamics and surface chemistry
		Organic Chemistry
		Environmental Chemistry
2	Applied Mathematics	Celesial Mechanics
		Fuzzy Logic / Game Theory/Algebra
		Fixed Point Theory and Application
3	Applied Physics	Biomedical Physics
		Nano Science & Applications
		Luminescence & Applications
		Solid State Ionics & Material Science
4	Civil Engg.	Structural Engineering
		Highways Engineering
		Environmental Engineering
		Geotechnical Engineering
		Water Resources / Irrigation Engineering
5	Computer Application	Artificial Intelligence & Soft Computer
		Data Mining & Knowledge Discovery
		Discrete Structure
		Software Engg.
6	Computer Science & Engg.	Sementic Web & Linked Dta
		Artificial Intelligence and Soft-computing
		Data Mining and Big Data
		Digital Image Processing and Computer Vision
		Advanced Computer Network and Security
7	Electrical and Electronics Engg.	Simulation and Modeling
		Power Systems
		Electrical Machines
		Control Systems & Instrumentation
		Power Electronics & Electric Drive
8	Electrical Engineering	Soft Computing
		Advanced Signal Processing and Applications
		Power Systems
		Electrical Machines
		Control Systems & Instrumentation
9	Electronics and Instrumentation	Power Electronics & Electric Drive
		Soft Computing
		Process Instrumentation and Process Control
		Industrial Instrumentation and Automation
		Process Modeling and Simulation
		Biomedical Signal Processing



**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI**  
**Syllabus Index Section - II (Specialization)**

S.No	Discipline	Specialization
		Transducer Design and Optical Instrumentation
		Soft Computing
10	Electronics and Telecomm. Engg.	Electronics
		Communication Systems
		Digital System Design & VLSI Design
		Signal and Image Processing
		Microwave Engineering
		Soft Computing
11	Information Technology	Information Security and Coding
		Mobile and Pervasive Computing
		Data Science for Internet of Things
		Pattern Recognition, Image Processing and Data Mining
		Semantic Web and Linked data
		Remote Sensing and GIS
12	Management	Behavioural Science
		Entrepreneurship
		Finance Management
		Human Resource Management
		Marketing Management
		Operation and Production Management
13	Mechanical Engineering	Design Stream
		Thermal Stream
		Production Stream
14	Pharmacy	Pharmaceutics
		Pharmacognosy
		Pharmacology
		Quality Assurance
		Pharmaceutical Chemistry
15	Environmental Engineering	Water Pollution Mitigation & Management
		Wastewater & Solid Waste Management
16	Water Resource Engineering	Surface water and Groundwater Hydrology
		Remote Sensing geographical information system (GIS) and Open Channel Flow
17	Humanities	Humanities
18	Architecture	Contemporary world architecture, related theories and trends



CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI  
छत्तीसगढ़ स्वामी विवेकानंद तकनीकी विश्वविद्यालय, भिलाई

No \_\_\_\_\_/2023

Date:

**To Whomsoever It May Concern**

(Service Certificate cum NOC for CSVTU, Bhilai Faculty)

This is to certified that Shri / Ms. .... is working as a regular faculty selected under statute 19 of the CSVTU, Bhilai/State Govt. and he / she is holding the post of ( Lecture/Asst.Prof./Asso.Prof.) ..... in the Dept. of ..... since ..... His / Her name in the updated seniority list (01.01.2023) of CSVTU, Bhilai is in Sl. No. .... in ..... Branch / Subject.

We do not have any objection if Shri / Ms ..... pursue his / her Ph.D. programme from Chhattisgarh Swami Vivekanand Technical University, Bhilai.

Institute  
Official Seal

**Principal**



CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI  
छत्तीसगढ़ स्वामी विवेकानंद तकनीकी विश्वविद्यालय, भिलाई

**Certificate and Forwarding Note by the Employers  
(Non CSVTU, Bhilai Organization)**

1. Name of the Employing Organization: .....

2. Type of Organization:

Central Government

State Government

Government Autonomous

Organization

Public Sector Enterprise

Private Sector Industry

Private Engg. College

3. Address of Administrative Office: .....

Phone: ..... Fax: .....

Email: .....

4. Designation of the employee seeking registration for Ph.D. at CSVTU, Bhilai

.....

5. Employment Details:

a) First joined on (date): .....

b) Holding the present: .....

c) Nature of appointment Temporary / Ad-hoc / Regular: .....

d) Nature of the Job: .....

(R & D, Design, Production, Marketing, Administrative, Teaching)

Certified that, Mr. /Ms. .... S/O, D/O, W/O:

..... employed as .....

In this organization is sponsored for admission to Full Time Ph.D. programme of CSVTU, Bhilai. He / She has been employed in this organization for the past ..... Years in a regular cadre. If selected as a sponsored candidate the organization has no objection to his/her undergoing four years of Full Time studies at CSVTU, Bhilai and its approved Ph.D. Research Centers.

Signature of Applicant

Signature of Institution Head

Name & Designation

Seal



CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI  
छत्तीसगढ़ स्वामी विवेकानंद तकनीकी विश्वविद्यालय, भिलाई

Declaration:

I here by declare that Mr/Ms....., Designation .....  
Department.....,Institute.....,Place.....  
..... is a ( Full time/Part time) ..... scholar of the Ph.D. program, CSVTU,  
Bhilai; enrolled in the research centre.....  
I have no objection for his/her attendance as per CSVTU ordinance for Full time /Part time admission (minimum  
75% in case of full time and 60 days per year-at least 3 days in a month for part time) at his/her research centre  
periodically, excluding attendance he/she will earn during the course work.

Seal /sign Head of the Institute

Seal/ Sign Employer