

Study Handbook



Study Program: Magister Ilmu Komputer (M.Sc. in Computer Science)
Faculty of Computer Science
Universitas Indonesia



2018 Edition

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1 Introduction

The Magister Ilmu Komputer (MIK) is a graduate research program opened in 1988, and is designed to produce research-oriented graduates in the field of computing, following on from the undergraduate education in computer science or related fields. Academic activities are carried out at the Depok campus of the Faculty of Computer Science, Universitas Indonesia (CS UI).

The MIK program emphasises the strong links between postgraduate education and research activities. Students are expected to be actively involved in the various research labs at the Faculty of Computer Science, Universitas Indonesia. The curriculum has been designed to provide students with the opportunity to deepen their understanding and also carry out significant research into the latest developments in the broad field of computing, including computer science, information systems, software engineering, etc.

The MIK program aims to produce experts in the field of computing who:

1. Possess integrity of character,
2. Upholds the ethics and code of conduct in academia and research,
3. Keeps abreast of the state of the art in the field of computing,
4. Able to apply their know-how and skills to solve real-world problems,
5. Able to make scientific contributions to the field of computing.

2 Admission Criteria

To be admitted to the Magister Ilmu Komputer (MIK) program, candidates must satisfy the following academic and administrative requirements:

2.1 Academic Requirements

- The candidate must already hold an undergraduate degree (S1) in the area of computer science, informatics, computer engineering, electrical engineering, mathematics, physics, or other fields related to computation.
- The candidate must have obtained a minimum GPA (or Indeks Prestasi Kumulatif / IPK) of no less than 3.00 (on a scale of 4.0).
- The candidate must successfully pass the entrance exam held by Universitas Indonesia, which consists of Academic Aptitude and English.

2.2 Administrative Requirements

The candidate must follow all registration steps and fulfill all requirements as stated in UI regulations. All detailed information and online registration forms can be obtained from <http://penerimaan.ui.ac.id>.

3 Curriculum

The Magister Ilmu Komputer program curriculum, henceforth simply the curriculum, is designed to provide students with the opportunity to deepen their understanding and also carry out significant research into the latest developments in the broad field of computing, including computer science, information systems, software engineering, etc.

In 2018, a significant curriculum revision was carried out. This section will describe the structure of the revised curriculum.

A summary of the curriculum can be seen in Table 1.

Subject Type	SKS	Percentage
Compulsory	8	20%
Basic Electives	10	25%
Advanced Electives	12	30%
Thesis (including proposal)	10	25%
Total	40	100%

Tabel 1. Summary of 2018 Curriculum

3.1 Compulsory Subjects

A list of the compulsory subjects can be seen in Table 2. Compulsory subjects are offered each semester.

Code	Subjects	SKS
CSCM801091	Research Methodology	4
CSCM801092	Independent Study	2
CSCM801093	Scientific Publication	2

Tabel 2. Detail of Compulsory Subjects

3.2 Basic Electives Courses

The MIK 2018 curriculum offers 7 (seven) different areas of specializations, i.e.:

1. Architecture & Infrastructure/Cloud Computing (related research lab: Computer Networks, Architecture & High-Performance Computing)
2. Computational Intelligence/Artificial Intelligence (related research lab: Machine Learning and Computer Vision)
3. Software Technology (related research lab: Reliable Software Engineering)
4. Large Scale Information Processing/Data Science(related research lab: Information Retrieval, Digital Libraries & Distance Learning, Computer Networks, Architecture & High-Performance Computing)
5. IS/IT Management/ IS/IT Governance(related research lab: Information Management, E-Gov & E Bussiness)
6. Enterprise Solution/ E-business (related research lab: Information Management, E-Gov & E Bussiness)
7. Information Security/Cyber Security (related research lab: Reliable Software Engineering, Computer Networks, Architecture & High-Performance Computing)

Elective subjects in the curriculum consist of:

- **Basic Elective Subjects** – which are designed to provide students with a strong theoretical foundation in their chosen topics of interest in computer science and information systems –
- **Advanced Elective Subjects** – which expose students to the latest developments and state-of-the-art in various research areas.

Basic elective subjects are shared with upper level electives in the undergraduate (or Sarjana) programs at UI, both in computer science and information systems, and are chosen due to their relevance and appropriateness to serve as foundations for studying the various research topics that are the focus of the various research labs at CS UI. On the other hand, advanced elective subjects are specifically designed for the postgraduate program, and the learning modality is typically more open-ended, with more discussion sessions and presentations of the latest work, e.g. conference and journal papers.

Students must take at least 10 SKS of basic elective subjects and 12 SKS of advanced elective subjects. From these, at least 6 SKS of basic elective subjects must belong to the same specialization, and at least 8 SKS of the advanced elective subjects must belong to that same specialization as well.

Tabel 3. Basic Electives Course List

Code	Course Name (Indonesian, English)		SKS	Architecture & Cloud Computing	Software Technology	Data Science	Artificial Intelligence	IS/IT Governance	E-business	Cyber Security
CSCE604129	Pemrograman Paralel	Parallel Programming	4	•	•	•	•			
CSCE604130	Bioinformatika	Bioinformatics	3				•			
CSCE604133	Pengolahan Citra	Image Processing	3			•	•			
CSCE604151	Embedded Systems	Embedded Systems	3	•						
CSCE604174	Basis Data Lanjut	Advanced Database	3	•	•			•		•
CSCE604210	Teori Informasi	Information Theory	3			•	•			
CSCE604212	Persamaan Diferensial	Differential Equation	3				•			
CSCE604228	Teknik Kompilator	Compiler Techniques	4	•	•					
CSCE604235	Pemelajaran Mesin	Machine Learning	3			•	•			
CSCE604231	Pengolahan Bahasa Manusia	Natural Language Processing	3			•	•			
CSCM604142	Desain & Analisis Algoritma	Analysis and Algorithm Design	4		•	•	•			
CSCE604241	Grafika Komputer	Computer Graphics	3		•					
CSCE604243	Kriptografi & Keamanan Informasi	Cryptography and Information Security	4	•	•				•	
CSCE604150	Organisasi Sistem Komputer	Computer System Organization	3	•					•	
CSCE604271	Layanan & Aplikasi Web	Web Services and Application	3	•	•	•			•	
CSCE604111	Simulasi & Pemodelan	Modelling and Simulation	3	•			•			
CSCE604113	Aproksimasi Sistem Nonlinier	Non-linear System Approximation	3				•			
CSCE604126	Penjaminan Mutu Perangkat Lunak	Software Quality Assurance	4		•					
CSCE604132	Komputasi Lunak	Soft Computing	3				•			
CSCE604135	Perolehan Informasi	Information Retrieval	3			•				
CSCE604131	Semantic Web	Semantic Web	3		•	•	•			
CSCE604144	Logika Komputasional	Computational Logics	3		•		•			
CSCE604152	Pengolahan Sinyal Dijital	Digital Signal Processing	3	•		•				
CSCE604154	Sistem Terdistribusi	Distributed Systems	3	•						
CSCE604184	Sistem Informasi Geografis	Geography Information Systems	3		•	•				
CSCE604225	Metode Formal	Formal Methods	4		•					
CSCE604233	Data Mining	Data Mining	3		•	•	•			
CSCE604134	Pengolahan Multimedia	Multimedia Processing	3			•				
CSCE604232	Robotika	Robotics	3	•			•			
CSCE604253	Rancangan Sistem Dijital	Digital System Design	3	•						
CSIE604276	Manajemen Infrastruktur	Infrastructure Management	3	•				•	•	
CSIE604163	Customer Relationship Management	Customer Relationship Management	3							•

Code	Course Name (Indonesian, English)		SKS	Architecture & Cloud Computing	Software Technology	Data Science	Artificial Intelligence	IS/IT Governance	E-business	Cyber Security
CSIE604278	Manajemen Layanan TI	IT Service Management	3					•		
CSIM603189	Manajemen Proyek TI	IT Project Management	3					•		
CSCE604179	Teknologi Mobile	Mobile Technology	3	•	•				•	
CSIE604180	Knowledge Management	Knowledge Management	3			•		•		•
CSIE604181	Dasar-Dasar Audit SI	Fundamental of IS Audits	3						•	
CSIM604182	Manajemen Sistem Informasi	IS Management	3					•		•
CSIE604161	E-health	E-health	3							•
CSIE604160	E-commerce	E-commerce	3							•

Tabel 4. Advanced Course

Code	Course name (Indonesia, English)		SKS	Architecture & Cloud Computing	Software Technology	Data Science	Artificial Intelligence	IS/IT Governance	E-business	Cyber Security
CSCE802231	Pengolahan Citra Lanjut	Advanced Image Processing	4			•	•			
CSCE802121	Verifikasi Perangkat Lunak Lanjut	Advanced Software Verification	4		•					
CSCE802222	Komputasi Paralel Lanjut	Advanced Parallel Computing	4	•		•				
CSCE802232	Kecerdasan Buatan Lanjut	Advanced Artificial Intelligence	4				•			
CSCE802133	Pemelajaran Mesin Lanjut	Advanced Machine Learning	4			•	•			
CSCE802141	Teori Komputasi Lanjut	Advanced Computational Theory	4		•					
CSCE802242	Logika Komputasional Lanjut	Advanced Computational Logic	4		•					
CSCE802134	Robotika Lanjut	Advanced Robotics	4	•			•			
CSCE802251	Jaringan Komputer Lanjut	Advanced Computer Network	4	•		•			•	
CSCE802171	Infrastruktur TI Lanjut	Advanced IT Infrastructure	4	•				•	•	
CSCE802262	CRM Lanjut	Advanced CRM	4							•
CSCE802181	Manajemen Pengetahuan Lanjut	Advanced Knowledge Management	4					•		•
CSCE802111	Komputasi Numerik Lanjut	Advanced Numeric Computing	4				•			
CSCE802123	Rekayasa Perangkat Lunak Lanjut	Advanced Software Engineering	4		•					
CSCE802235	Jejaring Semantik Lanjut	Advanced Semantic Web	4		•	•				
CSCE802172	Layanan TI Lanjut	Advanced IT Services	4	•				•		
CSCE802236	Perolehan Informasi Lanjut	Advanced Information Retrieval	4			•	•			
CSCE802237	Informatika Biomedis Lanjut	Advanced Biomedical Informatics	4			•	•			

Code	Course name (Indonesia, English)	SKS	Architecture & Cloud Computing	Software Technology	Data Science	Artificial Intelligence	IS/IT Governance	E-business	Cyber Security
CSCE802138	Analisis Data Spasial Lanjut	Advanced Data Spasial Analysis	4			•			
CSCE802143	Grafika Komputer Lanjut	Advanced Computer Graphics	4	•					
CSCE802144	Keamanan Informasi Lanjut	Advanced Information Security	4	•	•			•	
CSCE802152	Rancangan Sistem Dijital Lanjut	Advanced Digital System Design	4	•					
CSCE802245	Forensik Digital	Digital Forensics	4		•			•	
CSCE802147	Kriptografi Lanjut	Advanced Cryptography	4			•		•	
CSCE802246	Keamanan Jaringan dan Mobile	Network and Mobile Security	4	•				•	
CSCE802273	Teknologi Basis Data Lanjut	Advanced Database Technology	4		•		•		•
CSCE802124	Manajemen Proyek Lanjut	Advanced Project Management	4				•		
CSCE802282	Sistem Informasi Lanjut	Advanced information System	4				•		•
CSCE802264	E-Commerce Lanjut	Advanced E-Commerce	4						•
CSCE802265	E-Health Lanjut	Advanced E-Health	4						•
CSCE802099	Kapita selekta	<i>Capita selecta</i>	4						

Subjects with a code prefix of CSCE8021 may be offered during odd semesters, whereas subjects with a code prefix of CSCE8021 may be offered during even semesters. Subject offerings are made based on student interest and teaching capacity of the faculty.

3.3 Independent Study (Studi Mandiri) and Scientific Publication

Students should take Independent Study (Studi Mandiri) and Publication subject NOT earlier than 2nd semester. Those subject will prepare the students to deepen their interest in the area of computer science under guidance and supervision of a PhD holder lecture in the area or M.Sc holder with more than 5 years experiences. Note that the supervisor of Independent Study, Scientific Publication, Thesis Proposal, and Thesis SHOULD be the same. The minimum deliverable of independent study is an accepted publication (national/international journal article /conference paper). The grade is given by the supervisor based on the quality of the publication. Minimum passing grade is B.

Independent Study can be:

1. Literature study of their thesis/proposal topic based on books and papers.
2. Continuation of the previous works within the laboratory (inline with the Thesis' topic and under the same supervision). Students can do some research works (experiment) and write journal article or conference paper based on their works.

Scientific Publication can be publish in:

1. National Journal
2. International Conference

3.4 Thesis

One requirement for graduation from the MIK program is that students must carry out a significant research activity and produce a report in the form of a Thesis. The Thesis is a structured academic activity carried out by a student under the guidance of a thesis supervisor and must be a sufficiently thorough research activity concerning the area of computer science and/or information systems. Thesis topics will typically be related to the research interests of a faculty member.

In the 2018 MIK curriculum, the successful completion of a thesis entails passing two separate subjects, as shown in Table 5.

Code	Subject	SKS
CSCM802098	Thesis Proposal	2
CSCM802099	Thesis	8

Tabel 5. Stages of Thesis completion

CSCM802098 - Thesis Proposal (2 SKS): during the initial stages of writing a Thesis, students must first state their research plan in a proposal document, which must at least contain a description of the problem to be addressed, the objective and scope of the research, an overall workplan, and a suggestion of the evaluation technique. This proposal must be defended during an examination by a panel which includes the thesis supervisor and at least 2 (two) faculty members whose expertise is relevant to the topic. Students who are considered to not yet have an appropriate thesis proposal may apply for another defense until they eventually pass. There should be at least 3 (three) weeks before the preceding defense.

CSCM802099 - Thesis (8 SKS): students who have had their thesis proposals approved may proceed to work on their research in accordance to what was described in the proposal. After completing their thesis, and having obtained approval from their supervisor, a student must undergo a thesis defense with an examination panel of at least 3 (three) faculty members whose expertise is relevant to the topic, at least 1 (one) of whom served on the thesis proposal defense panel. The thesis supervisor does not become a

member of the examination panel, but may be present during the examination as an observer. The grade of a thesis, worth 8 SKS, is a combination of the following two aspects:

- An assessment made by the thesis supervisor on the performance of the student throughout the period of working on the thesis, which must be submitted to the academic secretariat before the thesis defense is held, and
- An assessment made by the examination panel of the quality and impact of the thesis work, which is submitted to the academic secretariat immediately after the thesis defense is concluded.

CSCM802098 and **CSCM802099** are not to be taken in the same semester.

3.4.1 Requirements

1. In order to be allowed to take the *Thesis Proposal* subject, students must submit a copy of a *Thesis Supervision Approval form* that has been signed by the supervisor.
2. In order to be allowed to take the *Thesis* subject, students must have passed **Research Methodology and Scientific Writing, Independent Study and Publication** and **Thesis Proposal**, and must have obtained a minimum of **28 SKS**, with an average GPA of at least **3.00**.

3.4.2 Thesis Activity and Assessment

1. The thesis research is conducted under the guidance of the thesis advisor. Each Student must produce a log that keeps track of all the scheduled meetings between the student and the thesis advisor. This control sheet can be obtained from the academic secretariat of the program.
2. A thesis advisor must have a Doctorate degree, or at least a Masters degree with a minimum of five years teaching experience, and a comprehensive understanding of the thesis topic concerned.
3. A thesis may be advised by one or two thesis advisors. The final deliverable of the thesis is a thesis document.
4. The format of the thesis document must follow the standard rules laid out by UI, which can be obtained from the library.
5. After the thesis is submitted to the academic secretariat, a thesis defense is scheduled, which consists of an oral presentation by the student and is followed by a defense of the thesis in front of a thesis committee.
6. In order to be allowed to take a Thesis Defense, students must have had passed Independent Study and Publication with the status of publication is Accepted.
7. The thesis defense is open to audience to attend. The chair of the thesis committee administers the defense process.
8. The thesis committee consists of the thesis advisor(s) and at least 3 (three) examiners.
9. The minimum passing grade for the thesis is B.

Selected thesis can be included into the Journal of Computer Science and Information Technology, published by the Faculty of Computer Science, Universitas Indonesia. Students (under the guidance of their thesis advisors) are expected to summarize their thesis into a paper by observing the rules and guidelines of the journal.

3.5 Matriculation

There are 4 (four) subjects that are considered to form the foundations of the field of study of the Magister Ilmu Komputer program, i.e. Discrete Mathematics 1, Data Structures & Algorithms, Operating Systems, and Database. If students enrolling into the program are deemed not to have a sufficient background in any of these areas, they may be required to take these subjects as matriculation subjects. Matriculation subjects are not considered part of the main curriculum, and are given a weight of 0 SKS in the academic transcript, as they do not affect the GPA of a student. The MIK course organizers will determine the number of matriculation subjects a student must take, if any, based on their results on a *placement test* conducted shortly after a student is first admitted to the program. The minimum passing grade of matriculation subjects is B.

Subjects	SKS
Discrete Mathematics 1	3 (counted as 0)
Data Structures & Algorithms	4 (counted as 0)
Operating Systems	4 (counted as 0)
Database	4 (counted as 0)

Tabel 6. List of matriculation subjects

3.6 Recommended Study Plan

This is a recommended study plan for the 2018 curriculum, to be completed in 4 (four) semesters:

Kode	MATA KULIAH	SKS
SEMESTER 1		
CSCM801091	Research Methodology	4
(elective)	Basic elective 1	3
(elective)	Basic elective 2	3
Total SKS semester 1		10
SEMESTER 2		
(elective)	Basic elective 3	4
CSCM801092	Independent Study	2
CSCM801093	Scientific Publication	2
(elective)	Advanced elective 1	4
Total SKS semester 2		12
SEMESTER 3		
CSCM802098	Thesis Proposal	2
(elective)	Advanced Elective 2	4
(elective)	Advanced Elective 3	4
Total SKS semester 3		10
SEMESTER 4		
CSCM802099	Thesis	8
Total SKS semester 4		8

The curriculum may also be completed in fewer than four semesters, by taking more subjects each semester. The maximum number of subjects that can be taken is determined by UI regulations, based on the academic performance of a student.

3.7 Transition Rules for Existing Students

The 2018 curriculum applies to existing students. The different with the previous curriculum is minor, only on the new modification in compulsory subject of Independent Study, i.e. Independent Study and Publication. Students who enrolled **before** the Odd semester of academic year 2017/18 can still follow the previous curriculum structure. The compulsory subject of independent study and publication can be replaced by one of the advanced elective.

3.8 Credit Transfer

For compulsory and basic electives, students who have previously passed subjects that are considered equivalent can apply to transfer the credits, which would (1) exempt them from taking the MIK subjects, and (2) count towards the credits achieved. When applying, students must submit all relevant documentation, i.e. copies of academic transcripts, course descriptions, syllabi, sample exams, etc. The MIK course organizers will assess whether the subject is eligible to be transferred or not, based on the following rules:

1. The subject to be transferred teaches the same matter and competencies as the corresponding subject in the MIK curriculum.
2. The subject to be transferred was taken within the last 5 (five) years.
3. The subject to be transferred was successfully passed with a minimum grade of B.
4. The subject to be transferred was taken at a study program that was held by a reputable institution. If at an Indonesian institution, the study program must have been accredited by the national accreditation board (BAN-PT) with a minimum grade of A.
5. The MIK course organizer reserves the right to impose any additional requirements to determine eligibility of credit transfer.

4 Academic Guidelines

4.1 Assessment

The credit units used at UI are Satuan Kredit Semester (semester credit unit), or SKS, which has the following guidelines:

1. The meaning of 1 (one) SKS roughly corresponds to 150 minutes/week, consisting of a combination of lecture session, structured study (e.g. lab session), or independent study and Publication. A four 4 SKS course will typically constitute 4 x 50 minute lectures per week for 14-16 weeks.
2. The final mark of a subject will be determined by the lecturer based on various marking components, including assignments, quizzes, midterms (UTS) or final exams (UAS). The weighting of each component is determined by the lecturer.
3. Midterm exams (UTS) are usually held after 7 (seven) full weeks of the semester, and final exams (UAS) are given at the end of the semester, i.e. after 14 (fourteen) weeks. Weighting of the exam grades and other assignments determined by the lecturer concerned.
4. Final grades are given in the form of letter marks, i.e. E,D,C,C+,B-,B,B+,A-, and A. The Grade Point Average (GPA), or *Indeks Prestasi Kumulatif* (IPK), is an aggregate measure of academic achievement across all subjects. IPK follows a scale of 0 (lowest) to 4 (highest), and the conversion from grades to IPK score uses the following table:

Grade (letter)	Score/weight
A	4.0
A-	3.7
B+	3.3
B	3.0
B-	2.7
C+	2.3
C	2.0
D	1.0
E	0.0

4.2 Academic Honesty and Code of Conduct

1. According to UI rule no.1/1996 dated 30 December 1996 concerning the Code of Regulations of Academic Life at UI, specifically Article 4 concerning Code of Conduct, all students must be honest in following the education process, research, writing publications, and other academic activities, and uphold the rules in carrying out any activity that is associated with the university in general.
2. Dishonesty that is not allowed includes, but is not limited to: plagiarism, unauthorized distribution of exam papers, forgery of exam and/or publication works, cheating, providing false information or data, etc.
3. The Dean of CS UI will take disciplinary action in the form of either warnings, admonishment, punishment, probation, suspension, or expulsion based on the severity and frequency of dishonesty cases.

4. Students are provided a mechanism for appealing any such decision to be reviewed.

4.3 Study Evaluation

4.3.1 Semester Evaluation (drop-out criteria)

The maximum study duration for the MIK program is 6 (six) semesters, excluding academic leave semesters. Academic achievement will be evaluated under the following rules (in accordance with UI Rector Decree No. 015/SK/R/UI/2016):

1. If after the end of the first 2 (two) semesters the IPK of a student does not reach a minimum of 3.00 from 14-18 SKS, the student is unable to continue (**drop-out**).
2. If after the end of 6 (six) semesters the IPK of a student does not reach a minimum of 3.00, or the student has not completed the curriculum requirements, and by additional requirement mentioned in UI Rector Decree, the student is unable to continue (**drop-out**).
3. If after two consecutive semesters, a student is not registered, that student is unable to continue (**drop-out**).

4.3.2 Degree Completion

After a student has obtained 40 SKS and completed all the curriculum requirements and UI requirements as mentioned in UI Rector Decree No. 015/SK/R/UI/2016, the student is eligible to obtain the degree of *Magister Ilmu Komputer (M.Kom)*.

4.3.3 Graduation Evaluation

Upon graduation, students achieve one of the following graduation predicates:

- **Cum Laude**, when IPK exceeds 3.70 and the study duration is no longer than 4 (four) semesters. If the study duration exceeds 4 (four) semesters, the graduation predicate is **Very Satisfactory**.
- **Very Satisfactory**, when IPK is between 3.41 and 3.70
- **Satisfactory**, when IPK is between 3.00 and 3.40

5 Descriptions of Advanced Electives

Description of Basic elective can be found at <http://panduan.cs.ui.ac.id>.

Advanced Image Processing

The course covers the special research topics related to the development in the field of study. At the beginning, several fundamental concepts in pattern recognition and image processing are given. The fundamental concepts includes the concept of digital image, standard methodology of image processing, description of objects in an image, feature extraction and selection methods, image segmentation and classification methods, unsupervised and supervised-based image analysis, soft computing, and development of a knowledge-based system. The discussions of the fundamental concepts are enriched by examples of the research results conducted by the related laboratory. The problem domains include remote sensing, biomedical, cultural heritage, and other applications. The graduate students are requested to find their own papers to be presented and discussed during the term. Several special topics that have ever been chosen include content-based image retrieval system, biomedical image and signal processing, data mining, object detection and recognition using several problem domains. After the period of student presentations, a summary of presented materials is constructed and related to the fundamental concepts that have been studied. The final student assignment is to write a report that could be in the form of a literature review report, or a research proposal, or a paper to be published.

- Gonzalez, R.C., and Woods, R.E., Digital Image Processing, Prentice Hall, 2002.
- Other Pattern Recognition and Image Processing books.
- Journals and Proceedings in Pattern Recognition and Image Processing.

Advanced Software Verification

This course discusses the theory underlying the verification of software that has been or will be produced compared to the initial specifications. The methods and basic theories to declare a formal and precise specification in temporal logic language will be studied. As a masters level course, this course will further discuss the latest developments in this field that include, among others, the language of logic, model checkers, theorem prover, software methodology paradigms that prioritize correctness such as the B-Method. This course will also introduce the applications of software verification in the industry in their simplified form.

- Paul, P. Boca, et.al, Formal Methods: State of the Art and New Directions.
- Larry Paulson, Lecture Notes on Software engineering, Cambridge University
- Papers in conference: Computer Aided Verification.
- Papers in journal : Formal Aspect of Computing , Springer

Advanced Parallel Computation

This course discusses the development of parallel computing technology, based on both super computer, distributed system and graphical processing unit. The topics discussed are the fundamental concepts and the recent topics in various articles published in journals as well as in international seminars/ conferences. The fundamental topics discussed include the basics of parallel and distributed computing, and recent topics from some publications. Among the topics are Introduction to Distributed and High-Performance Computing (HPC) ; Parallel programming models and performance analysis; self reading on High-Performance Computing architectures and Programming parallel computers; Data parallel programming ; Shared memory programming, threads and OpenMP ; High-performance distributed computing; HPC in Grid and cloud computing; GPU Computing; Self reading and experiments on MPI, PVM, Java RMI, and Java Cobra. The current issues coverage will be in the form of final project discussing recent topics in journals and proceedings. After completing this course, the students are expected to master the basics of parallel and distributed computing, to have the ability to apply parallel technology in various platforms, and

to know the recent developments in the field of parallel and distributed computing technology and therefore able to apply them to various topics in research and applications.

- Grama, A.; Gupta, A.; Karypis, G; Introduction to Parallel Computing, Second Edition, Addison Wesley, 2003.
- Vladimir Silva, Grid Computing for Developers, Charles River Media Inc, ISBN 1-58450-424-2, 2006.
- Anthony T. Velte, toby J. Velte, Robert Elsenpeter, Cloud Computing: A practical approach, Mg Graw Hill, ISBN 978-0-07-162694-1, 2010
- Jason Sanders, Edward Kandrot, Cuda by Example: an introduction to GP GPU programming, Addison Wesley, 2011
- Research articles related to parallel processing/computing appeared in international proceeding and journals.

CSC6801282 • Advanced Parallel Computation

This course is about the development of parallel computation technology based on super computer machine as well as distributed system. Topics studied in this course are latest issues that are also discussed in various international journals and conferences. The topics include fundamental of parallel and distributed computation and latest issues from scientific journals. For instance, Introduction to Distributed and High-Performance Computing; Parallel programming models and performance analysis; self-reading on High-Performance Computing architectures and Programming parallel computers; Data parallel programming and HPF; Shared memory programming, threads and OpenMP; High-performance distributed computing; Grid computing; Self reading and experiments on MPI, PVM, Java RMI, Java Corba, etc. After completing this course, students are expected to master the fundamental of parallel and distributed computation technology, have a good skill in implementing parallel technology in various fields and aware of latest updated parallel and distributed computation technology hence can be taken as research topics and developed further to be an application.

- Grama, A.; Gupta, A.; Karypis, G; Introduction to Parallel Computing, Second Edition, Addison Wesley, 2003.
- IEEE Transactions on Parallel and Distributed Systems.

CSC6801380 • Advanced Artificial Intelligence

During Basic Artificial Intelligence course, fundamental theories in Artificial Intelligence have been discussed. This course will discuss about advanced materials adapted to the latest development and implementation in on-going researches in Universitas Indonesia.

- Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach. 2nd edition. Prentice Hall, 2002

CSC6801381 • Advanced Machine Learning

This course provides advanced discussion of the Basic Machine Learning course. The materials will be based on the latest researches taken from literatures from scientific journal articles and conference papers as references.

- Goldberg, D.E., Genetic Algorithms in Search, Optimization, and Machine Learning, Addison Wesley, 2004.
- Christoper M. Bishop, Pattern Recognition & Machine Learning, New Yourk, Springer. 2006.
- Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd Ed. New York, NY: Wiley-Interscience, 2000.

CSC6801480 • Advanced Theory of Computation

This course discusses about theory of computation. Materials include detailed treatment on Turing Machine and language theory; theory of complexity; machine modeling (from the simplest Con-neumann (input-output process) to parallel computation modelling). Discussion topics also include other theories, such as lambda calculus or set theory.

- John C. Martin. Introduction to Languages and the Theory of Computation, 3rd Ed. McGraw-Hill. 2003.
- John E. Hopcroft, Rajeev motwani, Jeffrey D. Ullman. Introduction to Automata Theory, Languages and Computation, 2nd Ed. Addison-Wesley. 2003.
- Michel Sipser. Introduction to the Theory of Computation. PWS Publising. 1997
- Research articles such as Journal of Theoretical Computer Science.

CSC6801482 • Advanced Computational Logic

This course lead students to propositional logic and first-order predicate logic in computer science perspective. Discussion focusses on syntax and semantics, various normal form, substitution and unification, proof procedures, such as resolution calculus, soundness, completeness and decidability, logic programming with PROLOG. After completing this course, students are expected to have enough knowledge and skill in Computational Logic, thus, they can apply it in diverse application in information technology field.

- Fitting, M., First Order Logic and Automated Theorem Proving, second edition, Springer Verlag, 1996.
- Gallier, J., Logic for Computer Science: Foundations of Automated Theorem Proving, Harper and Row, 1986.
- Hoelldobler, S., Logik und Logikprogrammierung, third edition, Synchron Publishers GmbH, Heidelberg, 2003.
- Bratko, I., PROLOG programming for Artificial Intelligence, third edition. Addison-Wesley, 2001.
- Jurnal ACM Transactions on Computational Logic.

CSC6801581 • Advanced Robotics

This course gives further discussion about robotics, specifically about autonomous robot. The course materials include all aspects in robotics and adapted to the latest update of researches in Universitas Indonesia.

- Roland Siegwart and Illah R. Nourbakhsh. Introduction to Autonomous Mobile Robots. The MIT Press, 2004.
- ODE (Open Dynamic Engine) <http://www.ode.org>

CSC6801582 • Advanced Computer Network

This course discus about the latest update in theory and technology of computer networks, from aspects closer to hardware and electronic level to application aspects in cloud computing and mobile network. Materials are adapted to the latest update of researches in Universitas Indonesia.

- Kurose, J.F., K.W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet 4th ed. Addison-Wesley, Boston, 2008.

CSC6801781 • Advanced IT Management

As business world keeps on expanding, more regulation, various behaviors, morals and ethics, the issue about corporate governance becomes more important. Even in some industries, such as banking, not only

regulation corporate governance is strictly managed but also the IT governance. Thus, knowledge and skill in IT governance must be very essential for IS/IT professionals. This course gives student the understanding about various issues related to strategies and techniques in IT governance. Topics will include but not limited to how IT governance relates to corporate governance, techniques in IT governance, implementation mechanisms, leadership aspects in IT governance, etc.

CSC6801880 • Advanced Information Systems

The development of Information System involves the understanding about user's needs of information and how the information system development can support the organization to reach its goals. Information system development should be an integrated approach to human-computer interaction hence adaptive information system can be accomplished. At last, information system should be able to increase competitiveness and keep its strategic position in an organization. This course aims to see the state-of-the-arts from related Information System researches. This course will focus more on the methodologies to develop information system so that it can improve the organization performance. Several approaches in methodology as well as various methods, techniques, processes, procedures and tools will be discussed in detail. Besides, this course also explores the information system's contribution from being just a supporting system, such as catering application, to being an enabler to push the profitability up in distinct ways, i.e. by producing information quality, increasing decision making performance and improving various resources.

- Avison, David and Fitzgerald, Guy, Information Systems Development: Methodologies, Techniques, and Tools, 3rd Edition, McGraw Hill. 2003.
- Journal of ACM Transactions on Information Systems.
- Journal of Information System Research.

CSC6801881 • Advanced Knowledge Management

This course discusses about theory and application of knowledge management including technology and tools used in managing knowledge, integrated with the management needs for effectively providing knowledge in an organization. This course also discusses about computer representation characteristics, access and the utilization of knowledge versus information in the context of human resources. Through this course, students are expected to understand the fundamental concept of knowledge, creation, acquisition, representation, distribution, management, usage and re-usage; to understand the knowledge's role and usage in an organization and institution, also typical obstacle that needs to be handled; to understand core concept, method, techniques and tools used in knowledge management; to understand how to use and to integrate components and functions of different systems of knowledge management; to prepare to learn further in knowledge creation, engineering, transfer, representation, organization, and sharing; also to evaluate current trends in knowledge management and its benefit to business and industry.

CSC6802180 • Advanced Numeric Computation

This course discusses development, performance evaluation and numerical algorithm implementation to solve a certain mathematic problem. Covered topics are current issues including, i.e. matrix computation (especially related to solving large scale matrix computation problems or storage related problem that needs certain treatment), solving differential equation (both initial and boundary value problems), optimization and approximation (especially related to large scale un-constrained optimization problems and polynomial-based approximation), application (including current issues about the implementation of numeric computation in real world, for instance, image/signal processing, information processing, medical engineering, modeling, etc.). This course is given in a self-study scheme where each student is required to choose a specific case for the class project. Review about theory and fundamental framework of numeric computation is given in the first four sessions. In the next sessions, students are required to present the result of their numerical studies or experiments.

- Higham, N.J., Accuracy and Stability of Numerical Algorithms, SIAM publication, 1996.
- Heath, M., Scientific Computing – an Introductory Survey, 2003.
- Siam Journal on Computing.

CSC6802280 • Advanced Software Engineering

This course discusses the advanced topics on software development from the requirement phase, analysis, design, to the implementation phase. To complete the practical skills, this course teaches UML- based modelling (Unified Modeling Language) using specialized software. This lecture also teaches object-based development concepts to the software components.

- Humphrey, Watts S., Managing the Software Process, The SEI Series in Software Engineering, Addison-Wesley, 1989.
- Pressman, Roger S., Software Engineering: A Practitioner's Approach, McGraw-Hill, 199x.
- Jurnal IEEE Transactions on Software Engineering and Methodology.

CSC6802283 • Advanced Semantic Web

This course will discuss fully about semantic web, both on theory and practice to Web 2.0. The ontology concept will be studied here. The topics are adapted on the latest improvement and research undertaken by Universitas Indonesia.

- Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph. Foundations of Semantic Web Technologies. Chapman & Hall/CRC, 2009.
- John Hebel, Matthew Fisher, Ryan Blace, Andrew Perez-Lopez. Semantic Web Programming. Wiley Publishing, 2009.
- Dean Allemang, Jim Hendler. Semantic Web for the Working Ontologies. Morgan Kaufmann, 2008.

CSC6802284 • Advanced Web Services

This course studies the development of web service technology and the implementation on the information systems. The architecture and standard rules of the web service will be explained completely. The detailed issues are adjusted on the ongoing research by Universitas Indonesia.

CSC6802382 • Advanced Information Retrieval

This course explains about research and development of information retrieval systems. It includes a review of the user's behaviour regarding the need of information and how the information retrieval can support this. The development of information retrieval is an integrated approach of the interaction between human and computer. The goal is to find an adaptive information retrieval system. This system can't be considered as a component, but it is interconnected and evolving to respond the changes of information retrieval urgency. Covered topics are information retrieval systems development: system component, data structures and file structures, text and query operations; various methods of information retrieval system development: the use of artificial intelligence in information retrieval; evaluation of information retrieval: Retrieval Evaluation, User Interface and Visualization, Digital Libraries.

- Baeza-Yates, Ricardo and Rebeiro-Neto, Berthier, Modern Information Retrieval, Addison-Wesley New York, NY, 1999.
- Jurnal Information Processing & Management: an International Journal.

CSC6802383 • Advanced Biomedical Informatics

The current topics about the application and benefit of computer science on biomedic will be the main topic discussed on this course. It will always be adjusted to the latest research and development especially that managed by Universitas Indonesia.

CSC6802384 • Advanced Data Spasial Analysis

This course discusses specific topics of spatial data analysis in research and development of Geographic Information System (GIS), which basic concepts, methodology, and applications are already given in GIS course. Data sharing is an important issue on GIS, yet in real the GIS databases had been built for various applications that can be accessed by network. The topics covered are the use of automata cellular concept

and multi agent on GIS for dynamic modeling, spatial data (graphic) combination and non-spatial data (descriptive) techniques, the use of recent technique in speeding up the spatial query process and query of spatial database network. This course syllabus is highly depend on the status of current research topics.

- Lo, C.P., and Yeung, A.K.W., Concepts and Techniques of Geographics Information Systems, Prentice Hall, 2002.
- Jurnal IEEE transactions on Geoscience and Remote Sensing.

CSC6802481 • Advanced Computer Graphics

This course focused on the concepts and advanced techniques on Computer Graphics and Geometric Modelling, especially the shape representation schemes and algorithms. Some covered topics are affine spaces, polynomial curves and surfaces: Bezier scheme, spline curves and surfaces: B-spline scheme, blossoming concept dan technique (polar forms), subdivision surfaces, applications of geometric computing.

- Gallier, Jean H., Curves and Surfaces in Geometric Design: Theory and Algorithms, Morgan Kaufmann, 2000.

CSC6802483 • Advanced Information Security

This course discusses intensively about the latest improvement of Information Security and fundamental theory as a way to find out the current and future technology development. The issues will be adapted on the last research and progress done by Universitas Indonesia.

- Linda Volonino, Stephen Robinson. Principles and Practices of Information Security. Pearson, 2004.

CSC6802580 • Advanced Digital System Design

This course discusses the application and basic theory of modern digital system design in a large scale. The topics include FPGA, VHDL or other current progress based on the latest scientific paper.

High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices, Hall, Hall and McCall, Wiley.

- Digital Systems Engineering, Dally and Poulton, Cambridge.
- Synthesis and Scripting Techniques for Designing Multi-Asynchronous Clock Designs, Clifford E. Cummings, SNUG-2001. (Clock Domains and Synchronization) FPGA-Based System Design, Wayne Wolf, Prentice Hall PTR.

CSC6802680 • Advanced Enterprise Architecture and Systems

Enterprise Architecture Framework is commonly used by the industry. Therefore, it's important to know the ratio and analysis of some available framework. This course provide the basic knowledge of creating a framework for industry. The student of this course will have a strong basic on applying the rapid development of framework and ICT.

- How to Survive in the Jungle of Enterprise Architecture Frameworks: Creating or Choosing an Enterprise Architecture Framework Jaap Schekkerman Trafford Publishing ISBN 1-4120-1607-X, ISBN-13: 978-1412016070
- Enterprise Architecture As Strategy: Creating a Foundation for Business Execution Jeanne W. Ross, Peter Weill, David Robertson Harvard Business School Press ISBN-10: 1591398398, ISBN-13: 978-1591398394

CSC6802780 • Advanced Database Technology

This course provides a strong theoretical basis in aim to give a lesson about current database system. Students are not taught to use the technology, but they have to be able to understand and analyze the basic theory of the technology. The topics are adapted on the last research taking place in Universitas Indonesia.

- Elmasri and Navathe, Fundamental of Database Systems 4th Edition, Addison-Wesley, 2004
- Silberschatz, Korth and Sudarshan, Database System Concepts, 5th Edition, Mc Graw Hill, International Edition, 2006
- Connolly, Thomas and Begg, Carolyn: Database Systems 4th edition, Prentice Hall, 2005

CSC6802882 • Advanced E-Business & E-Government

This course assists student build the knowledge and skills on designing, guiding, and researching related to e-Business and e-Government development (business systems and government that utilize the communications and computation technology as its main competitive factor). This system includes concept and business model, business process, also the application of architecture and infrastructure. Specifically, this lecture explores the distributed application system technology and methods to integrate the business process on one or more organizations. Several recent studies will be provided to give the insight about success factors and general patterns of an e-Business and e-Government design.

6 Manager and Lecturer

6.1 Manager

Dean of Faculty of Computer Science	: Mirna Adriani, Ph.D.
Vice Dean for Education, Research, and Student Affairs	: Petrus Mursanto, Dr.
Vice Dean for Resources, Venture, and General Administration	: A. Nizar Hidayanto, Dr.
Coordinator of Master and Doctoral Program of Computer Science	: Prof. Wisnu Jatmiko, Dr. Eng.
Manager of Academic and Student Affairs	: Puspa Indahati Sandhyaduhita, M.Sc.
Administrative Staff	: Rita Prihandanari Dewi Ambarwati

6.2 Lecturer

Prof. Belawati H. Widjaja, Dra., M.Sc., Ph.D.
Prof. Aniasi Murni Arymurthy, Ir., M.Sc., Dr.
Prof. Heru Suhartanto, Drs., M.Sc., Ph.D.
Prof. T. Basaruddin, Drs., M.Sc., Ph.D.
Prof. Toemin Achmad Masoem, M.Sc., Dr.
Prof. Wisnu Jatmiko, S.T., M.Kom., Dr. Eng.
Prof. Zainal A.Hasibuan, Ir., M.S., Ph.D.
Achmad Nizar Hidayanto, S.Kom., M.Kom.,
Ade Azurat, S.Kom., Dr.
Adhi Yuniarto Laurentius Yohanes, Ir., M.Kom.
Adila Alfa Krisnadhi, S.Kom., M.Sc., Ph.D.
Amril Syalim, S.Kom., M.Eng.
Ari Saptawijaya, S.Kom., M.C.S., Ph.D.
Bayu Anggorojati, S.T., M.Sc., Ph.D.
Betty Purwandari, S.Kom., M.Sc., Ph.D.
Bob Hardian Syahbuddin, Ir., Ph.D.
Bobby Achirul Awal Nazief, Drs., M.Sc., Ph.D.
Dadan Hardianto, S.Kom., M.Kom.
Dana Indra Sensuse, Ir., M.LIS, Ph.D.
Denny, S.Kom., M.I.T., Ph.D.
Dina Chahyati, S.Kom., M.Kom.
Eko Kuswardono Budiardjo, Ir., M.S., Dr.
Erdefi Rakun, Ir., M.Sc., Dr.
Gladhi Guarddin, S.Kom., M.Kom.
Harry Budi Santoso, S.Kom., M.Kom., Ph.D.
Heri Kurniawan, S.Kom., M.Kom.
Ik Wilarso, dr., M.TI.
Ika Alfina, S.Kom., M.Kom.
Indra Budi, S.Kom., M.Kom., Dr.
Ito Wasito, M.Sc., Ph.D.
Kasiyah, Dra., M.Sc., Dr.
Lim Yohanes Stefanus, Drs., M.Math., Ph.D.
M. Ivan Fanany, S.Si., M.Kom., Ph.D.
Mirna Adriani, Dra., Ph.D.
Muhammad Rahmat Widyanto, S.Kom., M.Eng., Dr. Eng.
Muhammad Rifki Shihab, B.B.A., M.Sc.
Petrus Mursanto, Ir., M.Sc., Dr.
Puspa Indahati Sandhyaduhita, S.T., M.Sc.
Putu Wuri Handayani, S.Kom., M.Sc., Dr.
R. Yugo Kartono Isal, Drs., M.Sc., Dr.
Rahmat Mustafa Samik-Ibrahim, M.Kom.
Rizal Fathoni Aji, S.Kom., M.Kom., Dr.

Satrio Baskoro Yudhoatmojo, S.Kom., M.T.I.
Setiadi Yazid, Ph.D.
Siti Aminah, S.Kom., M.Kom.
Suryana Setiawan, Ir., M.Sc., Ph.D
Wahyu Catur Wibowo, Ir., M.Sc., Ph.D.
Widijanto Satyo Nugroho, Drs., M.Math., Ph.D.
Yova Ruldeviyani, S.Kom., M.Kom.
Yudho Giri Sucahyo, S.Kom., M.Kom., Ph.D.

7 Facility

7.1 Laboratories

Research laboratories related to Master Degree Program includes Digital Library and Distance Learning Laboratory, Reliable Software Engineering Laboratory, Computer Networks, Architecture and High Performance Computing Laboratory, Machine Learning and Computer Vision Laboratory, Information Retrieval Laboratory, Information Management Laboratory, E-Government and E-Business Laboratory. Each of them is equipped with personal computers and other specific equipments.

7.2 SCELE

To support teaching-learning activities, CS UI uses an online system called SCELE (Student-Centered E-Learning Environment). SCELE is developed based on Moodle open source learning management system. Via SCELE, students, lecturers and academic staff may access course materials, assignments (including submitting assignments), forums to facilitate communications between lecturers and students, and many other beneficial facilities. SCELE can be accessed through the following link <http://scele.cs.ui.ac.id>.

7.3 Access to Publication

To broader the literature study, UI provides the full access to national as well as to international databases consist of journal articles and conference papers, such as: SCOPUS, IEEEExplorer, ScienceDirect, EBSCO, PubMed, ACM, etc. These access is limited only for internal use inside Universitas Indonesia Campuses. Should lecturers, students and academic staff need the access from outside the campuses, they still can access it via the following link <https://remote-lib.ui.ac.id/login>.

7.4 Journals and Conferences Organized by CS UI

To accommodate CS UI students to publish their articles to national and international publication, CS UI organizes the following journals and conferences:

■ *Journal of Computer Science and Information Systems (JIKI)*

Journal of Computer Science and Information Systems or *Jurnal Ilmu Komputer dan Informasi* (JIKI) is a scientific journal in computer science and information containing the scientific literature on studies of pure and applied research in computer science and information and public review of the development of theory, method and applied sciences related to the subject. JIKI is issued 2 (two) times a year in February and June. This journal contains research articles and scientific studies. It can be obtained directly through the Library of the Faculty of Computer Science Universitas Indonesia. JIKI is accredited by the Ministry for Research, Technology and Higher Education (No:60/E/KPT/2016).

■ *Journal of Information Systems (JSI)*

Jurnal Sistem Informasi (JSI) aims to provide scientific literatures on studies of pure and applied research in information systems (IS)/information technology (IT) and public review of the development of theory, method and applied sciences related to the subject. JSI is projected to facilitate not only local researchers but also international researchers to publish their works either in Indonesian or English. JSI is accredited by the Ministry for Research, Technology and Higher Education (No:51/E/KPT/2017).

■ *International Conference on Advanced Computer Science and Information Systems (ICACSIS)*

ICACSIS provides an international forum that brings together those who are actively involved in the field of Computer Science and Information System to report on up-to-the-minute innovations and developments, to summarize the state-of-the-art, and to exchange ideas and advances in all aspects of systems engineering, human machine interface, and emerging applications.

■ *International Workshop on Big-Data and Information Security (IWBIS)*

IWBIS is an international forum that is designed to examine key critical innovations on the research of Big Data and Information Security areas. IWBIS wants to make a strong relationship between academics, engineers, scientists, and professionals to present their ideas and experiences in the fields of Big Data and Information Security. IEEE IWBIS welcomes paper submissions on innovative work from researchers in academia, industry and government describing original research work in Big Data and Information Security.

7.5 Library

Faculty of Computer Science Library which is located in UI Depok Campus is equipped with the following facilities:

■ *Books Collection*

CS UP's library collections is made up of approximately 11,000 books, magazines, journals, and research papers, including theses and student project reports. A digital library collection is also available, along with the supporting on-line services, that is called LONTAR.

Book borrowing service in CS UP's Library is a close system, means borrowers have no direct access to the book collection. Instead, borrowers need to contact the staff for assistance.

■ *Software and Manuals Collection*

This part contains software used in computer system in CS UI and the manual documentary. Manual documentary collection is available in open system, while software collection is in close system. Should students and academic staff need to access to any software, they may contact the librarians for assistance. Software collections are restricted to use in CS UI area only.

Besides, CS UI Building is located near The Crystal of Knowledge Building where Universitas Indonesia's Main Library is located in.

7.6 Building

The campus of Faculty of Computer Science is located in Universitas Indonesia Depok Campus, West Java. It captivates three buildings, i.e. A Building with two floors, B Building with six floors, and C Building with three floors. The total area of the buildings is approximately 10,000 meter square. A Building is utilized as open use computer laboratories available for all students, staff rooms also some rooms designated for Computer Technical Services Units. B Building is utilized as library, academic administration and student affairs office, also classrooms. C Building is utilized as research laboratories, staff rooms, and some rooms designated for Computer Technical Services Units.

7.7 Praying Room

The faculty has a praying room with air conditioner located in B Building 2nd Floor. It is facilitated with ablution room available separately for male and female.



**Magister Ilmu Komputer
Universitas Indonesia**

Gedung Fakultas Ilmu Komputer Universitas Indonesia
Kampus UI Depok, Jawa Barat

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