Republic of the Philippines
CEBU TECHNOLOGICAL UNIVERSITY

M. J. Cuenco Avenue Cor. R. Palma Street, Cebu City, Philippines
Website: http://www.ctu.edu.ph E-mail: information@ctu.edu.ph
Phone: +6332 402 4060 loc. 1137

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COURSE SYLLABUS

in

MATH MJR 3113

(Subject Code)

NUMBER THEORY

(Descriptive Title)

Syllabus Template for AY 2020-2021

1st Semester, AY **2020-2021**

Department/Area	:	College of Education
Curriculum	:	BSED-MATHEMATICS
Curriculum Year	:	Third Year
No. of Hours/Sem.	:	54 hours
Credit Unit(s)	:	3 units
Pre-requisite(s)	:	Advanced Algebra, Logic and Set Theory

Vision of the University : A premier, multidisciplinary-technological university

Mission of the University : The University shall primarily provide advanced professional and technical instruction for special purposes, advanced studies in industrial trade, agriculture, fishery, forestry, engineering, aeronautics and land-based programs, education, arts and sciences, health sciences, information technology and other relevant fields of study. It shall also undertake research, extension services and production, and provide progressive leadership in its areas of specialization.

Goal of the University : The University shall produce scientifically and technologically oriented human capital equipped with appropriate knowledge, skills, and attitudes. It shall likewise pursue relevant research strengthen linkages with the industry, community and other institutions and maintain sustainable technology for the preservation of the environment.

Teacher Education Program Outcomes (POs)

A. *Common to all programs in all types of schools:*
The graduates have the ability to:
1. Articulate and discuss the latest developments in the specific field of practice (PQF level 6 descriptor);
2. Effectively communicate in English and Filipino, both orally and in writing;
3. Work effectively and collaboratively with a substantial degree of independence in multi-disciplinary and multi-cultural teams (PQF level 6 descriptor);
4. Act in recognition of professional, social, and ethical responsibility; and
5. Preserve and promote "*Filipino historical and cultural heritage*" (based on RA 7722).

B. *Common to the discipline (Teacher Education):*
1. Articulate the rootedness of education in philosophical, socio-cultural, historical, psychological and political contexts;
2. Demonstrate mastery of subject matter/discipline;
3. Facilitate learning using a wide range of teaching methodologies and delivery modes appropriate to specific learners and their environments;
4. Develop innovative curricula, instructional plans, teaching approaches, and resources for diverse learners;
5. Apply skills in the development and utilization of ICT to promote quality, relevant, and sustainable educational practices;
6. Demonstrate a variety of thinking skills in planning, monitoring, assessing, and reporting learning processes and outcomes;
7. Practice professional and ethical teaching standards sensitive to the local, national, and global realities; and
8. Pursue lifelong learning for personal and professional growth through varied experiential and field-based opportunities.

C. Specific to a sub-discipline or major (Bachelor of Secondary Education Major in Mathematics)

1. **Exhibit competence in mathematical concepts and procedures;**
2. **Exhibit proficiency in relating mathematics to other curricular areas;**
3. **Manifest meaningful and comprehensive pedagogical content knowledge (PCK) of Mathematics;**
4. **Demonstrate competence in designing, constructing, and utilizing different forms of assessment in Mathematics;**
5. **Demonstrate proficiency in problem-solving by solving and creating routine and non-routine problems with different levels of complexity;**
6. **Use effectively appropriate approaches, methods, and techniques in teaching Mathematics including technological tools; and**
7. **Appreciate Mathematics as an opportunity for creative work, moments of enlightenment, discovery, and gaining insights of the world.**

Course Description:

This course is the study of the properties of numbers and their proofs. It presents the students with different methods of mathematical proving. It focuses on the discussion of the set of integers that include unique prime factorization, divisibility rules, Euclidean algorithm, linear congruences and linear Diophantine equations.

Course Learning Outcomes (CLOs): Within the semester, the students are able to:

1. Apply the concepts of prime numbers, divisibility, congruence and number theorems to real-life problems. (PO1, PO2, PO5)
2. Construct elegant mathematical proofs of statements. (PO1, PO5)
3. Investigate the logic and methods behind the major proofs. (PO1, PO3)
4. Appreciate the beauty of famous theorems: Fundamental theorem, the Chinese Remainder, Wilson's, Fermat's and Euler's among others. (PO2, PO7)
5. Work effectively as part of a group in designing test items in number theory. (PO1, PO4)
6. Use various resources and technological tools in the solution of real-life number theory problems. (PO5, PO6, PO7)

Course Content:

Intended Learning Outcomes	**Assessment Tasks**	**Teaching-Learning Activities**	**Contents**	**Learning Resources**	**Time Allocation**	**Remarks/ Evaluation/Notes**
Within the given period, the learners are expected to: explain the relevance of CTU's VMG to the demands of the 21st century and in the new normal (CO1)	collaborative promotional video highlighting CTU's VMG using the teacher's rubric	Interactive Lecture-discussion Collaborative Learning Written Task. Write in your own words the main idea of CTU's VMG *New normal* Recorded lectures, WebEx web conferencing, group discussions through ICT tools, individual and group work, videos	**I. Course Orientation** A. CTU's Vision, Mission and Goals College of Education's VMG B. Qualities of a Professional Teacher in the Light of K +12 Educational reforms and CTU's VMG C. Course Outline and Requirements	CTU website https://www.ctu.edu.ph/ CTU promotional video https://www.youtube.com/watch?v=lC5jB5w21L0 https://www.youtube.com/watch?v=xa0kdDSCq_c CTU Student Manual http://www.ctu.edu.ph/wp-content/uploads/2018/07/Final-Student-Manual-as-of-April-24-2018.pdf CTU Hymn https://www.youtube.com/watch?v=jLZpPzdkRoE Teacher's ppt. presentation Course Syllabus	Week 1	

Within the given period, the learners are expected to: Demonstrate an understanding of numbers and sequences. Evaluate sums and products. Familiarize and apply divisibility rules	Online Quizzes Pre-Midterm Exam *Performance Task:* 1. Students construct different types of assessment, with corresponding Table Specifications (TOS), the integers, primes and greatest common divisors.	*Asynchronous:* * read course materials in the Odilo LMS * inspect the real-world for manifestations of the integers * watch videos on the integers * take offline exams on sets *Synchronous:* * discuss through Zoom / Google meets * use interactive learning software, Google Jamboard * present to the class the student's formulated assessments with TOS * groupwork on solving real-life problems involving integers * take online exams on sets	**II. The Integers** A. Numbers and Sequences B. Sums and Products C. Divisibility	Number Theory and its Applications, 5th edition By Kenneth H. Rosen Pearson Addison Wesley 2005 Essential mathematics 2 Number theory The Open University 2015 250 Problems in Elementary Number Theory by w. sierpinski polish academy of sciences American Elsevier Publishing Company, inc. New York Pwn-polish Scientific Publishers Warszawa 1970 https://www.onlinemathlearning.com/number-sequence.html https://www.mathworksheets4kids.com/divisibility-rule.php http://www2.math.uu.se/~astrombe/talteori2016/lindahl2002.pdf Teacher's ppt. presentation Course Syllabus	Weeks 2 - 4	

					Weeks 1-4 Pre-Midterm	
Within the given period, the students can: Recognize prime numbers. Investigate the distribution of prime numbers. Find the greatest common divisor of 2 numbers using the Euclidean Algorithm.	Online Quizzes Midterm Exam *Performance Task:* 1. Students prepare a lesson on an assigned topic.	*Asynchronous*: * study course materials in the Odilo LMS * watch videos on the topic at hand * take offline exams *Synchronous:* * discuss interactively through Zoom / Google meets * use of interactive learning software, Google Jamboard * take online exams through Google forms	**III. Primes and Greatest Common Divisors** A. Prime Numbers B. The Distribution of Primes C. Greatest Common Divisors D. The Euclidean Algorithm	https://www.math-aids.com/Factors/Factor_Trees.html https://www.softschools.com/math/factors/worksheets/prime_factor_tree_worksheets/ https://www.math-salamanders.com/greatest-common-factor-worksheet.html https://www.rit.edu/studentaffairs/asc/sites/rit.edu.studentaffairs.asc/files/docs/services/resources/handouts/DM6_EuclideanAlgorithm_BP_9_22_14.pdf http://math.sfsu.edu/beck/310/1_euclid.pdf https://math.berkeley.edu/~shellym/math55eucAlgSol.pdf	Week 5 (A) Week 6 (B) Week 7 (C) Week 8 (D)	

				Teacher's ppt. presentation Course Syllabus	Weeks 5-8 Midterm	
Midterm Week			Midterm Week		Week 13	

Within the given period, the students can: E. Give an account of the proof of the Fundamental Theorem of Arithmetic. F. Solve Linear Diophantine equation in two variables. IV. A. & B Define congruence and solve systems of linear congruences. C. Apply the Chinese Remainder Theorem.	Online quizzes Pre-finals exam Performance task: The students showcase a video-teaching demo on their assigned topics.	*Asynchronous*: * study course materials in the Odilo LMS * watch videos on the topic at hand * take offline exams *Synchronous:* * discuss interactively through Zoom / Google meets * use of interactive learning software, Google Jamboard * take online exams through Google forms	E. The Fundamental Theorem of Arithmetic F. Linear Diophantine Equations **IV. Congruences** A. Introduction to Congruences B. Linear Congruences C. The Chinese Remainder Theorem	https://www.whitman.edu/mathematics/higher_math_online/section03.05.html http://sites.millersville.edu/bikenaga/number-theory/linear-diophantine-equations/linear-diophantine-equations.html https://www.whitman.edu/mathematics/higher_math_online/section03.01.html https://www.math.nyu.edu/faculty/hausner/congruence.pdf https://faculty.math.illinois.edu/~hildebr/347.summer19/nt2.pdf https://www.khanacademy.org/computing/computer-	Week 10 (E) Week 11 (F) Week 12 (A & B) Week 13 (C)	

				science/cryptography/modarithmetic/a/congruence-modulo	Weeks 10-13 Pre-Finals	
Within the given period, the students can: A. Investigate the historical background of Fermat's Last Theorem. B. Use Wilson's Theorem and Fermat's Little Theorem as the basis for primality tests and factoring algorithms. C. Express Euler's theorem and investigate its proof. D. Describe pseudo-primes	Performance Task: 1. Students perform a teaching Demo on an assigned topic in number theory The students review and make a critique on a research article in number theory.	*Asynchronous*: * prepare a video recording of a teaching demo on an assigned topic * review and critique an article in number theory *Synchronous:* * presentation of the video recording of the student's teaching demo.	**VI. Some Special Congruences** A. Fermat's Little Theorem B. Wilson's Theorem C. Euler's Theorem D. Pseudoprimes	https://primes.utm.edu/notes/proofs/FermatsLittleTheorem.html https://www.whitman.edu/mathematics/higher_math_online/section03.10.html https://mathworld.wolfram.com/Pseudoprime.html https://wstein.org/ent/ent.pdf https://www.fq.math.ca/Scanned/36-4/carlip.pdf Teacher's ppt. presentation	Week 14 (A) Week 15 (B) Week 16 (C) Week 17 (D) Weeks 14-17 Finals	

				Course Syllabus		
Finals Week			Finals Week		Week 18	

Course Requirements: Performance Tasks

1. Problem Sets
2. Weekly Quizzes
3. Class presentation on an assigned topic
4. Term Summative Examinations

Evaluation Procedure: 40% - Term Examinations
60% - Class Standing
20% - Problem Sets
20% - Weekly Quizzes
20% - Class Presentation

References

Don, E.(2009). *Schaum's outlines mathematica* (2nd ed). New York: McGraw-Hill.
Rosen, K. (2005). *Number theory and its applications* (5th ed). Tokyo: Pearson Addison Wesley.
Stein, W. (2017) *Elementary Number Theory: Primes, Congruences, and Secrets.*
Weil, A. (1979). *Number theory for beginners.* New York: Springer Verlag.

https://fac.ksu.edu.sa/sites/default/files/schaums_outlines_mathematica_2nd_edition.pdf
https://www.maths.ed.ac.uk/~v1ranick/papers/borevich.pdf
https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2013/05/An-Introductory-in-Elementary-Number-Theory.pdf
http://joshua.smcvt.edu/numbertheory/book.pdf
https://mathinoperation.wordpress.com/2016/10/19/number-theory-the-queen-of-mathematics/
http://www.math.lsa.umich.edu/~kesmith/euclidean.pdf

Videos

https://www.youtube.com/watch?v=-Qtl4nn7R4A (Number Theory)
https://www.youtube.com/watch?v=Wg-JlvBVPi0&list=PL22w63XsKjqwAgBzVFVqZNMcVKpOOAA7c (Divisibility)
https://www.youtube.com/watch?v=qEaxFxUK-es&list=PL22w63XsKjqwAgBzVFVqZNMcVKpOOAA7c&index=2 (Division Algorithm)
https://www.youtube.com/watch?v=fwuj4yzoX1o (Euclidean Algorithm)
https://www.youtube.com/watch?v=zIFehsBHB8o (Chinese Remainder Theorem)
https://www.youtube.com/watch?v=8CluknrLeys (Fundamental Theorem of Arithmetic)

https://www.youtube.com/watch?v=FjliV5u2IVw (Linear Diophantine Equations)
https://www.youtube.com/watch?v=oT7kRlh1nVQ (Fermat's Little Theorem)
https://www.youtube.com/watch?v=KDpf70xguCM (Fermat's Last Theorem)
https://www.youtube.com/watch?v=Rmtjry3HUMM (Wilson's Theorem)
https://www.youtube.com/watch?v=FHkS3ydTM3M (Euler's Theorem) https://www.youtube.com/watch?v=IUTGFQpKaPU
https://www.youtube.com/watch?v=S274dvVaE2M (Pseudoprimes)

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Contact Details: 09255082765

Prepared by: MARIA SALUD MEDIDA DELOS SANTOS, PhD
Faculty Member, Main Campus

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Upon Recommendation by the Curriculum Committee:

LYNNETTE MATEA S. CAMELLO, D.A.LitCom.
Language Expert

CRISTIE ANN L. JACA, PhD
University Director for Curriculum and Development

WILSON M. SAYABOC, PhD, D.A.LitCom.
University Director for Instructional Delivery, Monitoring and Evaluation

APPROVED:

HEDELIZA A. PINEDA, PhD
University Dean of Instruction